ISIS

International Review devoted to the History of Science and Civilization
Quarterly Organ of the History of Science Society.

SUMMARY

of No. 38 (Vol. XII, 2)

I. *Report of the Fifth Annual Meeting of the History of Science Society* 173
Fourth List of Members of the History of Science Society. 179

II. *Main Articles* (5).

J. W. THOMPSON *(Chicago)*. — The introduction of Arabic science into Lorraine in the tenth century. 184
E. G. R. WATERS *(Oxford)*. —A fifteenth century French Algorism from Liége (2 plates) 194
J. PELSENEER *(Brussels)*; — Une lettre inédite de NEWTON . . . 237
J. W. S. JOHNSSON *(Copenhagen)*. — La peste de 1763 en Dalmatie. III. (Pièces justificatives; notes) 255
T. J. RAINOFF *(Moscow)*. — Wave-like fluctuations of creative productivity in the development of West-European physics in the XVIIIth and XIXth centuries (7 fig.) 287

III. *Medallic Illustrations of the History of Science.* VI. . . 320

IV. *Notes and Correspondence* (3).

I. International Committee of the History of Science 323
II. Beldomandi ou Beldamandi? (G. LORIA) 323
III. Query nº 12. 'Umar al-'Âlim. (G. SARTON) 324

V. *Reviews* (10).

C. XVII. GUNTHER, R. W. T. Further correspondence of JOHN RAY. London, DULAU & Cº, 1928 (G. S.). 326
Byzantium. DELATTE, A. Anecdota Atheniensa. T. I. Liége, 1927 (G. SARTON) 328
China. JOHNSON, O. S. A study of Chinese alchemy. The commercial Press, Shangai, 1928 (B. LAUFER) . 330
Mathematics. CAJORI, F. A history of mathematical notations. T. I. Chicago, Open Court Pub. Cº, 1928 (G. S.). 332
Biology. NORDENSKIÖLD, E. The history of biology. Transl. by L. B. EYRE. New York, KNOPF, 1928 (G. S.). 336
Zoology. HERON-ALLEN, E. Barnacles in nature and in myth. Oxford University Press, 1928 (G. SARTON) . . 340
Geology. BREWSTER, E. T. This puzzling planet. Indianapolis, BOBBS-MERRIL Cº, 1928 (G. SARTON) 341
Psychology. LÉVY-BRUHL, L. Les fonctions mentales chez les sociétés inférieures, 8e éd. Paris, ALCAN, 1929 343
ALLIER, R. Les non-civilisés et nous, différence irréductible ou identité foncière. Paris, PAYOT, 1927 343
LEROY, O. La raison primitive. Paris, GEUTHNER, 1927 (H. METZGER) 343

VI. *Twenty fifth Critical Bibliography of the History and Philosophy of Science and of the History of the Civilization (to October 1928) 661 items contributed by ten scholars* 348

Plates (6).

10. A XVth C. algorism from Liége (f. 210 rº) 194
11. Id. (f. 210 vº) 194
12. A. VON HUMBOLDT. 321
13. L. PASTEUR . . . . . »
14. L. PASTEUR; P. CURIE . . . . . »
15. E. W. VON BRÜCKE . . . . . »

Report of the Fifth Annual Meeting of the History of Science Society.

(New York, December 28-29, 1928)

This meeting was the third bi-annual meeting with the American Association for the Advancement of Science, and also the fifth annual meeting of the Society. Its policy is to meet in alternated years with the American Association for the Advancement of Science and the American Historical Association, therefore the Society will meet with the latter Association in 1929 at Duke University, Durham, N. C.

The program presented in New York was the *History of Medicine and Civilization*, in conjunction with the American Association for the Advancement of Science and the New York Academy of Medicine. The meeting was held in the beautiful hall of the Academy at Fifth Ave. and 103rd Street on Friday afternoon, December 28 at 2.00 o'clock and a second session on Saturday morning, December 29 at 9.00 o'clock. Before and after the meeting the members had a remarkable opportunity to view the splendid exhibit of 15th and 16th century books pertaining to the history of medicine. This exhibit was arranged by the Librarian of the Academy, Dr. ARCHIBALD MALLOCH.

First Session, Friday afternoon, 2.00 o'clock.

(Each speaker allowed 30 minutes.)

Dr. LINSLY R. WILLIAMS, *Director*; Address of Welcome, New York Academy of Medicine.

Dr. LYNN THORNDIKE, *President*; History of Science Society, Presiding.

1. *Relation of Medicine to Magic and Science*. Dr. LYNN THORNDIKE Columbia University, New York.
2. *Teaching of Medicine in the Middle Ages*. Dr. DAVID RIESMAN Physician, Philadelphia, Pennsylvania,

3. *Medicine and Its Relation to Anthropology and Ethnology*, ... Dr. T. WINGATE TODD
School of Medicine, Western Reserve University, Cleveland, Ohio.
4. *Mutation in Historic Consciousness and the Continuance of Medical Ideas* Dr. JOHN C. HEMMETER, Physician, Baltimore, Maryland
5. *Role of Physicians as Poets and Men of Letters* Dr. GERALD B. WEB Physician, Colorado Springs, Colorado
6. *Role of Catholic Physicians and Scientists in the Advancement of Civilization* Dr. JAMES J. WALSH Physician, New York City
7. *Medical Men in Mathematics, Astronomy and Physics*, FREDERICK E. BRASCH
Library of Congress, Washington, D. C.

Second Session, Saturday morning, 9.00 o'clock.

(Each speaker allowed 30 minutes.)

Dr. WM. H. WELCH, *Director*, Institute of the History of Medicine, Presiding.

1. *Impressions Concerning Present Conditions of the Teaching and Study of Medical History in Europe* . Dr. WILLIAM H. WELCH
Institute of the History of Medicine, Baltimore, Maryland
2. *Medical Science versus Religion As a Guide to Life*, ... Dr. HARRY E. BARNES
(Address, Retiring Vice President for Section L)
Smith College, Northampton, Massachusetts
3. *Medicine As An Agency in the Advancement of Science, Art and General Civilization* . . . LT. COL. F. H. GARRISON
Army Medical Library, Washington, D. C.
4. *The Relation Between Medicine and Philosophy*, Dr. MORRIS R. COHEN
College of the City of New York, New York
5. *Relation of Medicine to Psychology* . . Dr. JOSEPH JASTROW
Psychologist, New York City
6. *Medicine's Contribution to Biology and Physiology*, ... Dr. VICTOR ROBINSON
Physician, New York City

7. *Medical Men As Early American Geologists*,
. . . . . Dr. WILLIAM BROWNING
Physician, Brooklyn, New York
8. *Relation of Medicine to the Art of Printing*,
. . . . . Dr. EDWARD C. STREETER
Physician, Boston, Massachusetts

The Society has lost by death this last year seven of its earliest members namely, Dr. EDGAR F. SMITH, President from January to May 1928, a former Vice-President Dr. LOUIS J. PAETOW, Dr. T. W. RICHARDS, Dr. A. C. COOLIDGE, Dr. ALEXANDER ZIWET, Dr. T. C. CHAMBERLIN and JONATHAN WRIGHT.

Following the Friday afternoon session the Council of the Society held its meeting with the President, Dr. LYNN THORNDIKE in in the Chair. Members of the Council present were Dr. SARTON, Dr. TYLER, Dr. BARNES, Dr. MAYER, Dr. WALCOTT, Dr. BIGELOW and Dr. SIMONS, and the Secretary-Treasurer. The election of officers for the ensuing year (1929) was the first business called for. Those elected were Dr. LYNN THORNDIKE, President; Vice-Presidents, Dr. HENRY CREW and Dr. H. W. TYLER; Recording Secretary, Dr. JOSEPH MAYER; Corresponding Secretary and Treasurer, F. E. BRASCH; and following are the new members of the Council Dr. FIELDING H. GARRISON, Dr. HARRY E. BARNES, Dr. W. CARL RUFUS, Dr. GREGORY WALCOTT and Dr. KARL SUDHOFF (Germany). Dr. SARTON presented his report on the status of *Isis* and the Editors' personal support to it. Mr. BRASCH presented the financial status of the Society and its present support to the journal. Dr. THORNDIKE presented a statement of the present movement to organize an International Committee for the History of Science as outlined in a report sent by Dr. MIELI of Paris. No action was taken, but the President expects to attend the conference called by Dr. MIELI in May 1929 to be held in Paris. Dr. TYLER presented an informal report on what had taken place in Oslo at the Historical Congress. The matter of having a representative at the Pan-Pacific Congress to be held in Java was also discussed but no definite action was taken, except that the Secretary should investigate the possibility of selecting a delegate and report to the President. Council approved of the

Society meeting at Duke University, Durham, N. C. in December 1929. Meeting adjourned at 6.45 P. M.

It was requested that a list of the past officers of the Society be annexed to this report as many new members are desirous to know the history of the organization. The Society was organized in 1924 and incorporated in 1925. The first meeting was held in Washington, D. C. in 1924 with the American Association for the Advancement of Science. The first President was Dr. L. J. HENDERSON with Dr. J. H. BREASTED and FLORIAN CAJORI as Vice-Presidents. The same officers were re-elected for 1925. The second President was Dr. J. H. BREASTED with Dr. DAVID EUGENE SMITH and Dr. L. J. PAETOW as Vice-Presidents (for 1926). The third President was Dr. DAVID EUGENE SMITH with Dr. EDGAR F. SMITH and Dr. LYNN THORNDIKE as Vice-Presidents (for 1927). The fourth President was Dr. EDGAR F. SMITH with Dr. J. C. MERRIAM and J. H. ROBINSON as Vice-Presidents (for 1928). Dr. SMITH died in office and Dr. LYNN THORNDIKE was elected to fill the unexpired term.

February 15, 1929. F. E. BRASCH.

ACCOUNT OF *ISIS* FOR THE YEAR 1928.

N. B. — This account does not refer to the numbers distributed to our members in 1928, nos. 33 to 36 (vols. 10 and 11; 36 is coming), a total of 1110 pages and 22 plates, but to the nos. which have been paid for in 1928, nos. 31 to 35, a total of 1140 pages and 18 plates. It will be easily seen that this does not make much difference.

Expenditures.		*Receipts.*	
Printing and mailing	2539.56	H.S.S.	1672
Brussels office	326.07	Sale of back vols. (1)	762
Cambridge office	344.77	Belgian subscriptions	133.76
Royalties	41.95		
Advertising	65.00		2567.76
	3317.35	(1) Brussels, 637 Washington, 125	

Printing cost per page (including plates) 2.23

Total publishing cost per page (including plates) 2.91

Of this total, 1.47 was paid by the H. S. S.,
1.44 by the Editor

Or, in other words, H. S. S. paid for 574 p., 9 pl.
Editor paid for 566 p., 9 pl.

It may be observed that the Editor is not a man of means. He has no income but the very modest one which he and his wife earn by their own labor.

Cambridge, Massachusetts GEORGE SARTON.
January 6, 1929.

FIFTH ANNUAL REPORT OF THE TREASURER AND CORRESPONDING SECRETARY OF THE HISTORY OF SCIENCE SOCIETY... ENDING DECEMBER 31, 1928.

Total membership for the ending 1927		577	
members admitted for the year 1928		76	
		653	
Lost by death, resignation etc.		33	
Total including foreign		620	Total beginning 1929.
Foreign		86	(paid to M. Guinet)
Domestic etc.		534	
Paid membership		354	For 1928
Unpaid »		180	

Total paid membership for 1928	354
Total paid membership for 1926 and 1927	64

Cash received from total paid membership		$ 2090.00
Cash received from full sets (ISIS)		125.00
		$ 2215.00
Royalty from Newton Memorial less nine copies bought		73.00
Total cash received for 1928		$ 2288.00

Dartmouth	$ 40.00
Colorado	20.00
Academy of M	20.00
Minnesota	25.00
Dr. Smith	20.00
	$ 125.00
Cambridge	40.00
(not paid)	

Total expenses as follows		
Printing	$ 162.00	
Filing cabinet	8.25	
Extra typing and translating	101.50	
Railroad fares to Balt. Phil. N.Y.	65.00	
Newton reprints	34.40	
Nine volumes of Newton Memorial	27.00	
Stamps and telegrams (exchanges)	57.00	

Honorarium	100.00		
Dr. Sarton for *Isis*	1400.00		
	$ 1955.15		
Dr. Sarton for *Isis* on 1927 acc.	499.00		
	$ 2454.15	Balance in Bank	$ 579.27
		Total cash received	2288.00
		Total expenses	2454.15
		Balance for 1928	$ 413.12

Total from dues for Dr. Sarton	$ 1672.00
Total paid to date to Dr. Sarton	1400.00
Balance due for 1928	$ 272.00
Sale of ISIS	125.00
	$ 397.00

Library of Congress
Washington D. C.

FREDERIC E. BRASCH.

Fourth List of Members of the History of Science Society**.

elected from August 1, 1927, to December 31, 1928

ADAMS, CHARLES W., M. A. Schoolmaster, Haileybury College, Hertford, England. 1927.

ADAMS, FRANK D., D. Sc., F. R. S., Emeritus Vice-Principal, McGill University, Montreal, Canada. 1928.

BALTA, J., Professor, School of Mines, Box N°. 151, Lima, Peru, South America. 1929.

BARROW, JOHN V., M. D., Physician, 142 South Windsor Blvd., Los Angeles, Calif., U. S., 1928.

BARTLETT, ETHEL L., Ph. D. Head of Chemistry Department, Illinois Woman's College, Jacksonville, Illinois, U. S. 1928.

BEAR, ORMOND W., Ph. D., Professor in Mathematics. Marquette University, Milwaukee, Wis., U. S. 1928.

BEARDSLEY, E. J. G., M. D., Physician, 1919 Spruce Street, Philadelphia, Penn, U. S. 1928.

BOLOGA, VALERIU, L., Sous-Directeur de l'Institut d'Histoire de la Médecine de l'Université, Cluj, Roumanie, 1928.

BUNKER, Jr., HENRY A., M. D. Physician, 29 Fifth Avenue, New York, N. Y., U. S. 1928.

CAMAC, C. N. B., A. B., M. D., Assist. Prof. Clinical Medicine, College of Physicians and Surgery, Columbia University, New York, N. Y., U. S. 1928.

CARR, PAUL R., Bookseller, 3923 Packard Street, Long Island City, N.Y., U. S. 1928.

CHAO, YUEN REN, Professor, Tsing Hua University, Peking, China. 1928.

CHITTENDEN, ARTHUR S., M. D. Surgeon-in Charge, Binghamton City Hospital. Binghamton, New York, U. S. 1928.

CLARKE, ELBERT H., Ph. D. Professor of Mathematics. Hiram College, Hiram, Ohio, U. S. 1928.

** For the previous lists, see *Isis*, 7, 371-93, 1925; 9, 7-10, 1927; 10, 7-10, 1928.

CORIAT, ISADOR H., M. D., Physician, 416 Marlborough Street, Boston, Mass., U. S. 1928.

COX, RICHARD T., Assistant Professor of Physics, New York University. New York, N. Y., U. S. 1928.

DATTA, BIBHUTIBHUSAN, D. Sc., P. R. S., Lecturer in Applied Mathematics University of Calcutta. Calcutta, India. 1928.

DAWSON, PERCY M., M. D. Assoc. Prof. Medical School and Adviser in Exper. College, University of Wisconsin, Madison, Wisconsin, U. S. 1928.

DEGRANGE, MCQUILKIN, Ph. D. Department of Sociology, Dartmouth College, Hanover, N. H., U. S. 1927.

DICKERSON, G. K., M. D., Physician, 280 Montgomery Street, Jersey City, N. J., U. S. 1928.

DRAPER, GEORGE, M. D. Assistant Professor of Clinical Medicine, Columbia University, 33 East 68 th Street, New York City, N. Y., U. S. 1928.

DRECKER, JOSEF, Professor, Westfall 33, Dorsten in Westfalen, Germany, 1928.

DUNNINGTON, GUY W., Assistant Professor, Washington and Lee University, Lexington, Va., U. S. 1927.

ELSEY, HOWARD M., Ph. D., Research Chemist, Westinghouse Electric and Manuf. Co., Research Laboratory, Ardmore Boulevard, East Pittsburgh, Penn., U. S. 1929.

EVANA, Miss ERNESTINE, c/o Coward McCann, Publishers, 425 Fourth Avenue, New York, N. Y., U. S. 1928.

FELDHAUS, FRANZ MARIA, Dr.-Ing. h. c. Historiker der Technik, Sachsenring 26/27. Berlin-Tempelhof, Berlin, Germany. 1928.

FORBES, ALEXANDER, Associate Professor of Physiology, Harvard Medical School, Milton, Mass., U. S. 1928.

FRIEDENWALD, HAR[illegible] M. D., Prof. of Ophthalmology, University of Maryland, Balti[illegible]re, Md., U. S. 1928.

FULTON, JOHN F., M. D., Physician, 29 Charlbury Road, Oxford, England. 1928.

GANGULI, SARADAKANTA, M. A., Professor of Mathematics, Ravenshaw College. Cuttack, India. 1928.

GAY, EDWIN F., Ph. D., Professor of Economic History, Harvard University, Cambridge, Mass., U. S. 1928.

GEDDES, PATRICK, Director of College des Ecossais, Montpellier, France. 1928.

GRAUSTEIN, WILLIAM C., Ph. D., Assoc. Prof. of Mathematics, Harvard College, Cambridge, Mass., U. S. 1928.

HILL, JULIAN W., Graduate Student, 3654 Shaw Street, St. Louis, Mo., U. S. 1928.

HOEBER, PAUL B., Medical Publisher, 76 Fifth Avenue, New York, N. Y., U. S. 1928.

KALLERT, ELLIS, M. D., Physician Schenectady Hospital, Schenectady, N. Y., U. S. 1929.

KELLY, T. HENSHAW, M. D., Physician, 490 Post Street, San Francisco, Calif., U. S. 1928.

KOKOMOOR, F. W., Assistant Professor of Mathematics, University of Florida, Gainesville, Florida, U. S. 1928.

LAKE, KIRSOPP, Ph. D., Winn Professor of Ecclesiastical History, Harvard University, Cambridge, Massachusetts, U. S., 1928.

LEAVITT, JULIAN, R. D. 42, Norwalk, Conn., U. S., 1928.

LOWES, JOHN L., Professor of English, Harvard University, Cambridge, Mass., U. S. 1928.

MCCRACKEN, ROY, Ph. D., Research Chemist, 210 West 17th Street, Wilmington, Delaware, U. S., 1929.

MCKIE, DOUGLAS, Assistant in the Dept. of History, Methods and Principles of Science, University College, University of London, London, England, 1928.

MACPIKE, EUGENE FAIRFIELD, Research Scholar, 5418 Woodland Ave., Chicago, Ill., U. S. 1929.

MCTAVISH, W. C., Ph. D., Prof. of Chemistry, New York University, New York City, U. S. 1928.

MARKER, JAMES P. H., Hon., LL. D., Sc. D. Ph. D., 357 Ninth Street, Brooklyn, N. Y. U. S. 1928.

MAROTTE, FRANCISQUE, Prof. au Lycée Charlemagne, 35 bis, rue de Reuilly, Paris, 12e. 1928.

MEANY, EDMOND S., Ph. D., Professor of History, University of Washington, Seattle, Wash., U. S. 1928.

MERRIMAN, ROGER B., Ph. D. Professor of History, Harvard University, Cambridge, Mass., U. S., 1928.

OLIVER, JOHN R., M. D., Professor of History of Medicine, University of Maryland, Baltimore, Md., U. S. 1929.

PARTRIDGE, EDWARD A., Head of Dept. of Science, West Phila. High School, Philadelphia, Pennsylvania, U. S. 1927.

PATTERSON, THOMAS S., Ph. D., Professor of Organic Chemistry, University of Glasgow, 89 Oakfield Ave., Hillhead, Glasgow, Scotland, 1929.

PORTER, A. KINGSLEY, Ph. D., Boardman Professor of the Fine Arts, Harvard University, Cambridge, Mass., U. S. 1928.

PRIEST, IRWIN G., Ph. D., Physicist, U. S. Bureau of Standards, Washington, D. C., U. S. 1928.

RAND, EDWARD K., Ph. D., Professor of Latin in Harvard University, Cambridge, Mass., U. S. 1928.

REICH, NATHANIEL, Ph. D., Professor of Egyptology and Orientalistics, Dropsie College, Philadelphia, Penn., U. S. 1928.

RUSKA, JULIUS, Dr. Director, Forschungs-Institut für Geschichte der Naturwissenschaften, Schloss, Portall 19, Berlin, C 2, Germany. 1928.

SALANT, WILLIAM, M. D., Medical Department, University of Georgia, Augusta, Ga., U. S., 1929.

SMITH, WILBUR M., D. D., Presbyterian Minister, 421 Riverside Avenue, Covington, Va., U. S. 1927.

SNEIDE, OLE J., 118 Sixth Avenue, San Francisco, California, U. S. 1927.

SPINDEN, HERBERT J., Ph. D. Peabody Museum of American Archaeology and Ethnology, Harvard College, Cambridge, Mass., U. S. 1928.

STILLWELL, MARGARET B., M. A., Librarian and Curator, The Annmary Brown Memorial, Providence, R. I., U. S. 1928.

STROHL, JEAN, Ph. D. Prof. of Zoology, University of Zurich, Switzerland. 1927.

THOMSON, ELIHU, Ph. D., Sc. D., Consulting Engineer, 22 Monument Avenue, Swampscott, Mass., U. S. 1928.

THORNTON, FRANCIS E., M. D., Physician, 2524 Kimball Avenue, Chicago, Ill., U. S. 1928.

TORY, Dr. H. M., Ph. D., President, National Research Council, Ottawa, Canada. 1928.

VAISH, M. A. H. Bayley Sarai Street, Biharsharif Behar, India, 1928.

VOYNICH, WILFRID M., Ph. D., Rare-Book Dealer, 33 West 42 nd. Street, New York, N. Y., U. S. 1929.

WALCOTT, Gregory Dexter, Ph. D., Professor of Philosophy. Long Island University, Brooklyn, N. Y., U. S. 1928.

WEINBERGER, BERNHARD W., M. D., Practising Orthodontist, 119 West 57th Street, New York, N. Y., U. S. 1929.

WILLIAMS, KENNETH P., Ph. D. Professor of mathematics, Indiana University, Bloomington, Indiana, U. S. 1928.

WRIGHT, LOUIS T., M. D., Physician, 218 West 139th Street, New York City, U. S. 1928.

ZILBOORG, GREGORY, M. D., Neuro-Psychiatrist, Bloomingdale Hospital, White Plains, N. Y., U. S. 1928.

Institutional Members

American Geographical Society. Library. Broadway at 156th Street, New York City, N. Y., U. S. 1928.

Bibliothek Warburg, Hamburg, Germany. 1928.

Dartmouth College Library. Hanover, New Hampshire, U. S. 1927.

George Washington University Library. (Dr. A. F. W. Schmidt, Librarian) Washington, D. C., U. S. 1929.

Instituto-Escuela, calle del Pinar, 21, Madrid, Spain. 1928.
Municipal Library. Salah Ed Din Post Office, Alexandria, Egypt. 1928.
Skidmore College Library, Saratoga Springs, N. Y., U. S. 1928.
Stanford University Library, Stanford University, Calif., U. S. 1928.
U. S. Army Medical Library. 7th and B Street, S. W. Washington, D. C., U. S. 1928.
Universitätskasse, Kiel, Germany. 1927.
University Library, Cambridge, England. 1928.
University of Colorado Library. Boulder. Colorado, U. S. 1928.
University of Michigan Library. Ann Arbor, Michigan, U. S. 1928.
University of Minnesota Library. Minneapolis, Minn., U. S. 1928.

The Introduction of Arabic Science into Lorraine in the Tenth Century

« Down to the twelfth century the share of Christian Spain in the diffusion of Saracen learning seems to have been small..... In general, the lure of Spain began to act only in the twelfth century..... [But] the discovery of evidence from the tenth century (984) requires a reopening of the question » (1)

It is the purpose of this brief article to show that : (1) the intellectual avenue between Spain and Europe beyond the Pyrenees, which was as old as the Roman Empire, was never wholly closed ;(2) Arabic science was introduced into the schools of Lorraine and was cultivated there before GERBERT. So far as I am aware, when and how Arabic science first found its way into Lorraine has not yet been explained, although other scholars before professor HASKINS have recognized the eminence of Lotharingian churchmen of the eleventh century in mathematics and astronomy (2).

The intellectual nexus netween Spain and Gaul which was close in imperial times, was not broken by the barbarian invasions. On the contrary, the fact that for nearly a century the Visigothic domination prevailed on both sides of the Pyrenees cemented that relation the more, and the intellectual relation between the two countries continued on through the sixth, seventh and eighth centuries.

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(1) HASKINS, *Studies in the history of mediæval science*, 8-9 and note 20.

(2) Professor HASKINS, differing from Mr. REGINALD LANE POOLE, associates the introduction of the abacus into England « with the movement which connected England with the schools of Lorraine », *op. cit.* 333. Elsewhere, writing of the treatise on the astrolabe, ascribed to GERBERT or HERMANNUS CONTRACTUS and containing numerous Arabic words, Professor HASKINS remarkes that evidently « an acquaintance with this instrument had in some unknown way passed into Latin Europe in the course of the eleventh century », *op. cit.* 115. The present article, I think, shows the probability that this knowledge took root in Lorraine in the middle of the tenth century.

The history of the three oldest Mss. of the Vulgate casts some light on this matter. Professor E. K. RAND, in his masterly critique of DOM QUENTIN's memoir on the text of the Vulgate (3), has shown that « the entire tradition depends on three ancient books » : the *Ottobonianus* (saec. VII), the *Turonensis* (saec. VII) and the *Amiatinus* (saec. VII). There is a Spanish group, a Cassinian group and an Italian group of Vulgate Mss. derived from these parent texts. But in as much as the Cassinian group is derived from a Spanish text, and « the leader of the Spanish group is the *Turonensis* » (4), it is apparent that Spanish tradition in regard to the Vulgate Mss. is predominant (5). ALCUIN's own edition of the Vulgate was derived from *Amiatinus*, the famous codex which was brought from Italy to Northumbria and returned again to Italy. ALCUIN knew the *Ars grammatica* of JULIAN OF TOLEDO (ca. 680-87), which was also known earlier to BEDE and ALDHELM (6).

Spanish influence north of the Pyrenees was stimulated by CHARLEMAGNE's conquest of the territory north of the Ebro, and its union with the Frank Empire. Spanish churchmen like THEODULF OF ORLEANS and CLAUDIUS OF TURIN were less distinguished representatives of the Carolingian renaissance than ALCUIN (7). There is no trace of any Spanish scholar at the court of CHARLES THE BALD (840-77), but MARTIN OF TOLEDO's « Lecture Notes » enjoyed considerable influence and popularity in the schools of Gaul in the ninth century. Fragments of them are found in

(3) *Harvard Theological Quarterly*, XVII, 212.

(4) *op. cit.* 212.

(5) In the reign of CHARLEMAGNE, THEODULF, bishop of Orleans and a native of Spain, prepared an edition of his own of the Vulgate. According to BERGER, THEODULF had a now lost Spanish text before him (*Theta*); according to DOM QUENTIN this text was *Ottobonianus*; according to professor RAND the theory that *Ott.* is the immediate ancestor of *Theta* cannot be sustained. He thinks that THEODULF possessed « a copy of some Spanish form of text not derived directly from *Ott.* but related to it », *op. cit.* 236.

(6) BEESON, *Miscellanea Franz Ehrle*, Rome, 1924.

(7) I have elsewhere in two articles shown the large interest of the Frank Empire in Spain during the reign of LOUIS THE PIOUS (814-40) — « The origin of the word Goliardi », *Studies in philology* XX, 83-98; « The manuscripts of EINHARD's Vita Karoli », *Mélanges Henri Pirenne*, 519-32. And for the commercial relations between the Frank Empire and Mohammedan Spain see my *Economic and social history of the middle ages*, 236-37, 258-59.

a tenth century manuscript written in Spain, and in a Bodleian manuscript of about the same date (8).

Additional evidence of close intellectual relation between Frank Gaul and Spain is found in the history of the scriptorium of Lyons (9). An unusual numbre of these Mss. at Lyons are of Spanish origin, and apparently a cluster of Spanish monks or clerics was dwelling at Lyons in the ninth century (10). The pro-symbol for *per*, which is common in Frank charters of the eighth century « constitutes a permanent feature of the script » of Visigothic Mss. (11). There is also evidence of the tenacious survival of Visigothic palaeographical pecularities (12). In Plate XXII (ninth century) « the hand is contemporary with the Visigothic, and seems to labour directly under its influence. Possibly the exemplar was Visigothic » (13). Plate XXIV is taken from the famous Ms. of the Code of the Visigoths-*Lex Romana Visigothorum*) although the Ms. itself is of Frank execution.

Furthermore, it must not be forgotten that PRUDENTIUS, bishop of Troyes and the first of the three compilers of the *Annales S. Bertiniani* (835-61) was a Spaniard. Under the year 858 he informs us that a certain monk from the monastery of ST. VINCENT the Martyr in Cordova came into Gaul bringing with him the relics of three Spanish martyrs (14). In 864 CHARLES THE BALD sent two ambasasdors to the khalif of Cordova, who returned to Compiègne in the following year « cum multis donis, camelis videlicet,

(8) LEISTNER, « The revival of Greek in western Europe in the Carolingian age », *History*, October 1924, 184.

(9) See TAFEL, « The scriptorium of Lyons » in LINDSAY, *Palæographica Latina*, II, 66 f. and especially E. A. LOWE, *Codices Lugdunenses antiquissimi*, Lyons 1924

(10) LOWE, *op. cit.* 16.

(11) LOWE, *op. cit.* 33.

(12) LOWE, *op. cit.* Plate XXI, p. 39 is a Visigothic hand of the ninth century. « We probably have here the work of a Spanish-trained cleric whose native peculiarities have been rubbed away by a sojourn at Lyons ».

(13) LOWE, *op. cit.* 39.

(14) AIMON OF ST. GERMAIN DES PRÉS (died 896) was the author of two works commemorating this event : *Historia translationis S. Vincentii ex Hispania in Castrense Galliæ monasterium* (855), written in prose and verse. WINTERFELT, *Poetæ Latini* IV, 138-40, has published a good edition of the text. But there is not even a good text of his other work : *De translatione SS. martyrum Georgii monachi, Aurelii et Nathaliæ ex urbe Corduba*, MIGNE, *Pat. Lat.* CXIV, 939-60. Neither of these works has been carefully studied for information on intellectual relations between Spain and France before GERBERT's time.

lecta et papiliones gestentibus, cum diversi generis pannis et multis odoramentis (15).

This traditional relation of the Carolingians with Spain survived on into the tenth century. The archives of Barcelona contain 45 Carolingian charters between the years 930 and 961, and those of Vich have 13 more (16). In the residue of the tenth century France's contact with Spain diminished, and was not resumed until the inception of the Spanish crusades.

It is admitted that this evidence is not large for the intellectual relations between France and either Christian or Mohammedan Spain in the ninth and tenth century. Yet ideas follow trade and courier routes.

We are on solider ground when we inquire into the relation between Saxon Germany, i.e. Germany in the reign of OTTO THE GREAT (936-73) and Mohammedan Spain. WIDUKIND the Saxon chronicler of the time enumerates a long list of oriental importations brought into Germany from Saracen lands. He does not specifically say from Spain; but we know from other evidence that some of these wares came from the western khalifate (17). LIUTPRAND's *Antapodosis* was written at the request of RECEMUNDUS, bishop of Elvira, who was sent as an ambassador to OTTO I in 956 by the khalif ABDERRAHMAN III, and whom LIUTPRAND met when the German court was at Frankfort (18). It was doubtless from the bishop that LIUTPRAND learned of the victory of RAMIRO II of Leon over the Mohammedans in 939 (19),

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(15) *Annal. Bertin*, 865. We may supplement this evidence by a charter of CHARLES THE BALD of the year 859 for Aureolus, the original of which is preserved in the archives of the duke of Medinaceli, caja 3A. See CALMETTE, *La diplomatie Carolingienne*, 63, note 3.

(16) LAUER, *Le règne de Louis d'outremer*, 305-11.

(17) ...diversi generis munera, vasa aurea et argentia, aerea quoque et mira varietate operis distincta, vitrea vasa, eburnea etiam et omni genere modificata stramenta, balsamum et totius generis pigmenta, animalia Saxonibus antea invisa, leones et camelos, simias et strutoines, WIDUKIND, *Rerum gestarum saxonicarum*, III, 57. Cf. G. JACOB, « Arabische Berichte von Gesandten an German. Fürstenhöfe », *Quellen z. deutsch. Volkskunde* (1927), Heft 1.

(18) J. BECKER, *Die Werke Liutprands von Cremona*, Einleitung, VIII-IX (1915). On ABDERRAHMAN III see A. MULLER, *Der Islam im Morgen- und Abendland* (Berlin, 1887). II, 96 f; G. DIERCKS *Geschichte Spaniens*, I, 259, f. (Berlin 1894).

(19) SCHAFER, *Gesch. von Spanien*, II, 183 f.; MULLER, *op. cit.* II, 522; DOZY, *Histoire des Musulmans d'Espagne*, II, 39.

and of that astonishing raid of the Hungarians into the peninsula early in the tenth century, of which the Arabic historian MAS'UDI has made mention (20).

This diplomatic visit of the bishop of Elvira to Germany was the Spanish khalif's reply to an embassy which OTTO I had dispatched to Mohammedan Spain three years before. In these times the Saracens were not only in occupation of almost all Spain and the whole of Sicily, but also had extended their domination over Provence from Marseilles to Grenoble. Indeed, they had control of most of the Alpine passes, and even Piedmont and German Switzerland were ravaged by them. In addition, their corsairs terrorized the western Mediterranean, and time and again harried the seaboard cities of the Riviera (21).

Although OTTO I had not yet extended the German domination south of the Alps, he was deeply interested in Italian affairs, and hence in 953 determined to send an ambassador to Cordova with a view to abate the evil. His choice fell upon the monk JOHN of the monastery of Gorze near Metz in Lorraine (22).

JOHN OF GORZE — he was not made abbot until 960-74 — is a neglected figure in the intellectual movement of the tenth century. The monastery had been founded in the middle of the eighth century by CHRODOGANG OF METZ, but fell into decay in common with all monasticism, during the ninth century. In 919, as it was without walls, it was sacked by the Hungarians. GORZE's recovery began with the movement for monastic reform initiated

(20) ed. MARQUART, 150, 159.

(21) See SACKUR, *Die Cluniacenser*, I, 222-30; POUPARDIN, *Le royaume de Provence sous les Carolingiens*, 243-73; KELLER, « Der Einfluss der Sarrazen in die Schweitz », *Mittheil. der antiq. Gesellschaft in Zürich*, XI, 14.

(22) The Life of JOHN OF GORZE, *De vita Joannis abbatis Gorziensis*, was written soon after his death in 974 by his friend JOHN, abbot of St. Arnulf in Metz. It may be found in *MGH. SS.* IV, 337-47 and in MIGNE, *Patrologia Latina*, CXXXVII, 421-310. The best account of JOHN OF GORZE is in SACKUR, *op. cit.* I, 146-56; II, 358-61. See also STREBER, « Abt JOHANNES VON GORZE » in WETZER's *Kirchenlexicon*, 2d ed. VII, 1684-86, and SCHULZE, « War JOHANNES VON GORZE historischer Schrifsteller? », *Neues Archiv*, IX (1884), 497-512. I have not seen MATHIEU, *Johannis abbatis Gorziensis vita* (Nancy, 1878). The history of Gorze has been written by LAGER : « Die Abtei Gorze in Lothringen. » *Studien und Mittheilungen aus dem Benedict- und Cisterc. Orden*, VIII (1887), 32-56, 181-92, 328-47, 540-74. The Ms. cartulary, still unpublished, is in Bibliothèque Nationale, No. 5436, of which a description may be read in CHAMPOLLION-FIGÉAC, *Documents inédits* II, CXIV Cf. SACKUR, *op. cit.* II, 127.

by GÉRARD OF BROGNE in Brabant in the first quarter of the tenth century, whence it spread into the Rhinelands and was promoted by BRUNO OF COLOGNE. Gorze became the chief seat of this activity, so much so that it is sometimes known as the Gorzean Reform (23).

This moral restoration in Lorraine quickly led to an intellectual revival in the monasteries, of which Gorze became a leading light. Within its hospitable walls foregathered scholarly monks from Metz, Toul, Verdun, Burgundy, with now and then a visitor from England, Ireland, Scotland and Calabria (24). In and around Metz in the middle of the tenth century was a congenial group of scholarly monks and clerics interested in mathematics and astronomy and music. Among them were SALECHO, a clerk of St. Martin's « ultra fluvium Mosellae », BANDINCUS, a priest of St. Symphorian « extra portam urbis meridinam », BERNACER, « skilled in calculation and music », who was a deacon of St. Stephen's, ROTLANDUS, cantor of the cathedral in Metz, WARIMBERTUS, a canon of the same church, and most remarkable of all, some nuns of a local convent among whom one, Sister GEISA, is named (25).

It must have been a great day for this group when JOHN OF GORZE returned from a long journey which he and his friend BERNACER made to Italy, where they visited Rome, Monte Cassino, Naples — and viewed the smoking cone of Vesuvius with wonder — Mont Gargano, Benevento and Apulia (26). From Lower Italy, which as every scholar knows, was at this time rich in Greek tradition and culture, JOHN brought back precious Mss. to Gorze,

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(23) For details see my *Feudal Germany*, 57-62; SACKUR, *op. cit.* I, 150 f.

(24) Istuc congregavit de Graecia videlicet, Burgundia ac de penitus toto divisis orbe, Britannia, Mettensibus, Tullensibus, Verdunensibus — *Miracula S. Gorgonii*, c. 26 SS. IV, 246. Coetum quoque Grecorum ac Scottorum agglomerans non modicum propriis alebat stipendiis commixtum diversis linguæ populum — *Vita Gerardi episcopi Tullensis* (963-94), *SS.* IV, 486, c. 19; Nam Scotti et reliqui sancti peregrini semper sibi dulcissimi habebantur, *Vita Adalberonis II episcopi Mettensis* (984-1005), *SS.* IV, 659 f., c. 26; Cf. SACKUR, *op. cit.* I, 146-49; II, 358-62.

(25) *Vita Joannis Gorz.* caps. 17, 33, 41, 43, 52.

(26) There are allusions to this journey in *Vita*, caps. 24, 33, 38, 52. Perhaps JOHN and his friend also visited Salerno, where ODO OF CLUNY had stayed in 940, and where his *Vita* was written — SACKUR, *op. cit.* I, 337, 344, and in *Neues Archiv* XIV, 105. Here the ducal major domo, whose name was JOHN, was well known for his scholarly interests — *Vita Odonis*, prolog.; BACKUR, *op. cit.* I, 112, 359 note 2. On the school at Salerno see C. and D. SINGER, « The school of Salerno », *History*, Oct, 1925, 242 f.

among them ARISTOTLE's *Categories*, and PORPHYRY's *Isagogia* (27). The Greek revival in Saxon Germany was not wholly due to the Byzantine wife of OTTO II and her protégé, JOHN OF CALABRIA.

Whether JOHN OF GORZE had picked up some knowledge of Arabic during his Italian journey we are not told. But certainly his experience as a traveller, his wide culture, made him the best qualified person for OTTO I to employ when he wished to send an ambassador to Cordova in 953. Unfortunately the *Vita* is not so full of information upon JOHN's journey into Spain as upon his travels in Lower Italy, and no Spanish chronicle supplements it like that of VOLTURNO. But two precious bits of information are vouchsafed. In Mohammedan Spain JOHN OF GORZE fell in with a Spanish Jew named HASDEU, who understood Latin, and of course was acquainted with Arabic (28), and bishop RECEMUNDUS who was JOHN's guide and friend in the difficult negotiations with the khalifate, we are told, was « et litteris optime tam nostrorum quam ipsius inter quos versabatur linguæ Arabicæ institutus » (29).

JOHN dwelt in Cordova in intimate association with these two men for nearly three years. It is not explicitly recorded, but it is impossible not to believe that a man of so much intelligence and culture, so deeply interested in mathematics and astronomy, brought back with him to Gorze from Cordova some Arabic Mss. of scientific nature, as he had formerly brought back similar Mss. from Lower Italy. (30) Moreover, we are justified in inferring that JOHN OF GORZE acquired some knowledge of the Arabic language while in Spain from Spanish Jews who understood Latin.

(27) *Vita* caps, 24, 33; *Chron. Vulturn*, Muratori, SS. I, b, 422; Cf. SACKUR, *op. cit.* II, 358; HAUCK, *Kirchengeschichte Deutschlands*, III, 351; GIESEBRECHT, *Kaiserzeit*, II, 745, 779, 785 (5th. ed.); ABBO OF FLEURY, a little later than this — he died in 1004 — had an example of ARISTOTLE's *Categories*, SACKUR, *op. cit.* II, 345. The *Categories* and *Isogogia* were both in the library of Montier-en-Der when ADSO was abbot there (died 992). SACKUR, *op. cit.* II, 362. The catalogus which he compiled has been published by OMONT, *Bib. de l'École des chartes*, 1882, p. 157 f.

(28) *Vita*, c. 121. On Spanish Jews who understood Latin see DOZY, *Recherches*, I, 87; LAGER, *op. cit.* 189-92.

(29) *Vita*, c. 128.

(30) One wonders, in this connection, whether GERBERT may not later have got some Arabic scientific Mss. from Gorze. For he was forced to flee from France in the spring of 997, and OTTO III gave him the domain of Sasbach near Strasburg, whence he wrote a letter in behalf of count HERMANDUS, probably HERMANN

While we lack positive evidence of the pursuit of Arabic science in the schools of Lorraine in the years immediately following JOHN OF GORZE's return from Spain, the constructive evidence points to it, and inverse reasoning affirms it. How else are we to explain the fact that « Lorraine... in the eleventh century was the chief centre for the study of the abacus, and produced such eminent mathematicians as HERIGER OF LOBBES, ADELBOLD OF UTRECHT, REGINALD OF COLOGNE, and RALPH and FRANCO OF LIÈGE » ? (31) Or how else can we account for the transmission of Arabic learning across the Channel into England in the persons of ROBERT DE LOSINGA, who became bishop of Hereford, WALCHER OF MALVERN, WALCHER OF DURHAM, THOMAS OF YORK and SAMSON OF WORCESTER ? (32).

I am convinced that the schools of Lorraine in the last half of the tenth century were the seed-plot in which the seeds of Arabic science first germinated in Latin Europe, from which the knowledge radiated to other parts of Germany — witness HERMANN CONTRACTUS in Reichenau — to France, and especially, owing to the preference of KNUT THE GREAT for Lotharingian churchmen, into England.

And yet, until ADELARD OF BATH, Arabic learning was still so little cultivated in western Christendom that GUIBERT DE NOGENT could write : « Scientia scilicet astrorum quæ apud Occidentales tenuior extat et rarior, eo apud Orientales ubi et originum habuit, continuo usu ac frequenti memoria magis fervere cognoscitur (33) » — a declaration remarkable both for its recognition of the value of the new learning and its tribute to the Arabs.

One word more : As all the world knows, knowledge of Arabic

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a brother of ADALBERON, bishop of Verdun, who was being warred upon by THIERRY count of Metz and duke of Upper Lorraine — See LOT, *Hugues Capet* 290, 291, 294; *Lettres de Gerbert*, ed. HAVET, No. 182. That GERBERT at this time was interested in mathematics is shown by his *Ep.* 186 to OTTO III in which he writes that he is sending him a copy of BOETHIUS' *Arithmetic*. This Ms. is probably identical with that now in Bamberg library, HJ. IV, 12, apparently written in the tenth century. Did it originate at Gorze ?

(31) HASKINS, *op. cit.* 334.

(32) On all these see HASKINS, *op. cit.* 334. The last two were not natives of Lorraine but received part of their education in Lotharingian schools.

(33) *Recueil des croisades*, Hist. Occident, IV, 246. Cf. III, 814; IV, 193.

science increased by leaps and bounds during the latter half of the twelfth century. In this development the great monastery of Cluny may have had a part which has not been appreciated. ODO OF CLUNY wrote a *Compotus* and many works on music, some of the information in which may have been drawn from Arabic sources which were made available for him in Latin translation when he was at Salerno (34). But quite apart from this, Cluny was the great promotor of the Spanish Crusades in the eleventh century (35) and its library, although the catalogue gives us no clear information to that effect, must have profited by the acquisition of Spanish and Arabic Mss. (36). The fact that PETER THE VENERABLE, ca. 1150 sponsored a Latin translation of the Koran is further evidence of Cluny's interest in Arabic knowledge. Spanish monks were so numerous at Cluny in the eleventh century that the Spanish rite was regularly celebrated there (37).

(*Chicago*). JAMES WESTFALL THOMPSON.

P. S. — The Jewish communities in Lyons, Marseilles and Bordeaux in the ninth century, and later, were in commercial relation with Spain, Italy and the Orient. This is especially true of the Jews of Lyon. AGOBARD of Lyons (died 840) in his polemical tract, *De insolentia Judaeorum* (*), protested against the coming and going of Spanish Jews between Spain and the Frank kingdom; and this evidence is sustained by other sources (**). The history of art in the Middle Ages also contributes to this information. For M. EMILE MÂLE in his recent and fascinating work,

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(34) Mr. HENRY G. FARMER, « The Arabian influence on musical theory », *Journal Royal Asiatic Society*, Part I (1925) makes no mention of ODO OF CLUNY as a writer upon music, yet his writings on this subject are voluminous. They are to be found in MIGNE, *Pat. Lat.* CXXXIII.

(35) See SACKUR, *op. cit.* II, 101-13; BOISSONADE, *Du nouveau de chanson de Roland*.

(36) See DELISLE, *Catalogue des manuscrits*, II, 499 f. For Cluny's share in the loot of the Saracens in Spain see RODOLFUS GLABER, *Historiarum Libri*, ed. PROU, bk. IV, cap. 7, p. 101. Cf. SACKUR, *Neues Archiv*, XIV, 405 and his *Die Cluniacenser*, II, 112.

(37) ROD. GLABER, *op. cit.* III, 3, p. 62.

(*) MIGNE, *Pat. Lat.* CIV. Cf. AGOBARDI, Epist. 4, 6, 7, 8, 9, 10 : MGH. *Epist. Merov. et Karol. ævi*, III.

(**) MGH. *Formulæ*, ed. ZEUMER, 309, 325. Cf. ARONIUS, *Die Regesten zur Geschichte der Juden... bis* zum 1273, 81, 82.

L'Art et les artistes du moyen âge (1927), in two chapters entitled « Mosquée de Cordoue » and « L'Espagne arabe et l'art roman » has made a comparative study of the monuments north and south of the Pyrenees, which opens a new horizon. He shows that relations between Christian France and Mohammedan Spain were more frequent and more intimate than we have hitherto believed. He cites much evidence for the presence of monks at Cordova in the ninth century; Cluniac monasteries in Aragon, Castille, Leon; a French quarter at Toledo; and more astonishing, Spanish Arabs sending presents to the Virgin of Puy. The cathedrals of the Midi were situated upon routes followed by thousands of pilgrims and borrowed architectural motifs from the mosques of the Peninsula.

J. W. T.

The Jew HASDEU mentioned in the text might be identical with the great ḤASDAI IBN SHAPRUT, who died in 970 or 990 at Cordova. See my *Introduction* (vol. 1, 680). It is true the name ḤASDAI was not uncommon in Jewish Spain.

G. S.

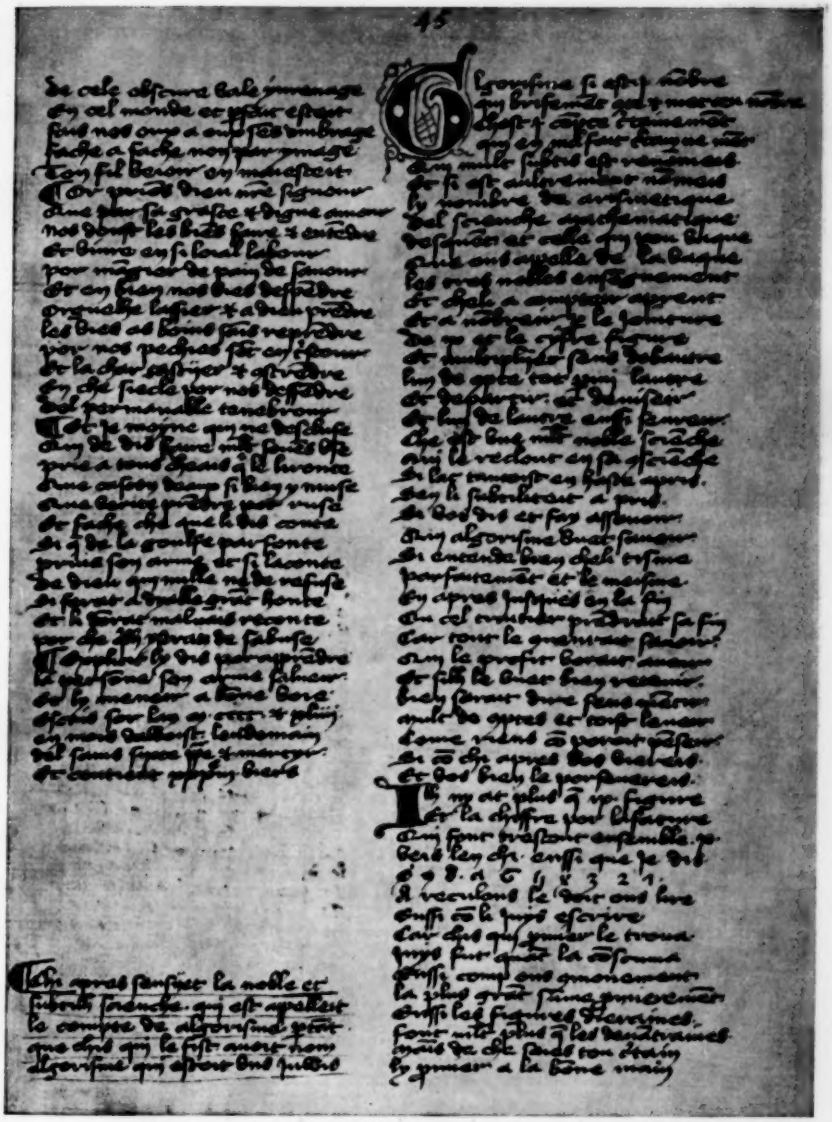
A Fifteenth Century French Algorism from Liége.

THE MANUSCRIPT. Ms. 10457-62 of the Bibliothèque Royale at Brussels contains an algorism in French verse which has not hitherto been published. In the printed catalogue (1), where the Ms. is numbered 6513, particulars will be found of the other contents of the volume, the principal being the Chronicle of JEAN DE STAVELOT (fo. 4-164) (2), *Li Patron del Temporaliteit* by JACQUES DE HEMRICOURT (fo. 165-190), *Le Miserere* by the RENCLUS DE MOILIENS (fo. 194-210), and *Le Codicile* attributed to JEAN DE MEUNG (fo. 214-233). The whole volume is in the same handwriting, that of the indefatigable calligrapher, compiler and chronicler JEAN DE STAVELOT (1388-1449), a monk in the Benedictine Abbey of St. Laurent near Liége (3). Statements made by the scribe on fo. 4 and 154 inform us that the portion of the volume contained between these folios was compiled during the years 1440-45; the remainder of the volume was therefore written between 1445 and the scribe's death in 1449. The algorism, which is written in columns of verse, two columns to a page, 51 to 54 lines to a column, occupies fo. 210b to 212c. A brief prose heading occupies the last five lines of col. 210a. Col. 212d is blank. The large initial G (in error for A) in v. 1, occupying a height of four lines, is red ornamented with blue. There are large blue or red initials also, each two lines high, at vv. 37, 69,

(1) *Catalogue des Manuscrits de la Bibliothèque Royale de Belgique*, IX, par J. VAN DEN GHEYN et E. BACHA, Brussels, 1909, p. 293.

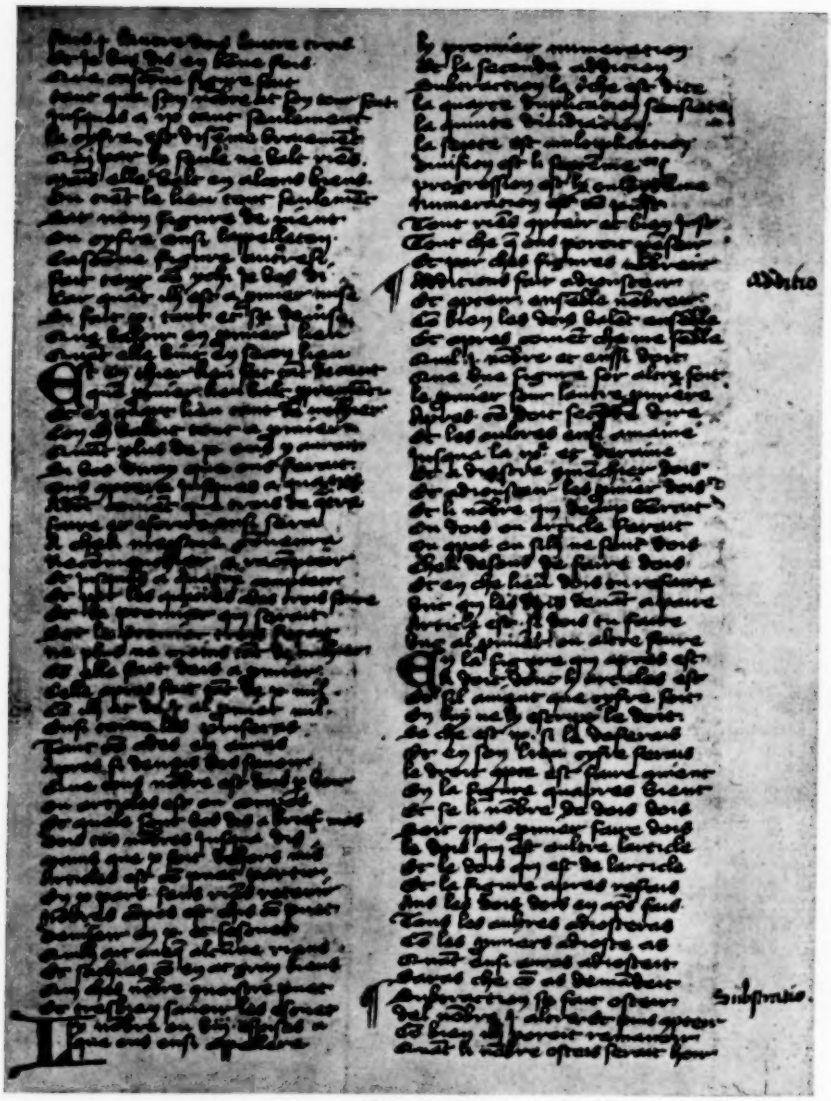
(2) Edition by A. BORGNET, *Chronique de Jean de Stavelot* (*Collection de Chroniques belges inédites*), Brussels, 1861.

(3) See F. DE REIFFENBERG, in *Annuaire de la Bibliothèque Royale de Belgique*, I, 1840, pp. 49 ff.; E. GACHET, in *Compte-rendu des séances de la Commission Royale d'Histoire*, first series, XIV, Brussels, 1848, pp. 165 ff.; A. DINAUX, *Trouvères, Jongleurs et Ménestrels...*, IV, Paris and Brussels, 1863, pp. 439 ff.; G. GRÖBER, *Grundriss der romanischen Philologie*, II, 1, Strassburg, 1902, pp. 1174 f. GACHET, *op. cit.*, p. 185, quoted vv. 1-7, 37-43 and 46-51 of the algorism.



A XVth Cent. French Algorism from Liége (f. 210 r°).

Isis, xii, pl. 10. E. G. R. Waters.



A XVth Cunt. French Algorism from Liége (f. 210 v°).

Isis, xii, pl. 11. E. G. R. Waters.

104, 138, 168, 204, 230, 268, 306, 342, 370, 417 and 455. The other lines begin with a small capital or an ordinary letter containing a vertical red stroke. I am indebted to Professor L. C. KARPINSKI for supplying me with rotagraphs of the pages here concerned.

CONTENTS. The poem, as preserved, consists of 496 octosyllabic lines; but short passages appear to be missing after vv. 62, 65, 77, 149, 169, 176, 379, and perhaps elsewhere. A prologue (vv. 1-36) explains the meaning of algorism, its utility, and the advantages to be derived from a thorough knowledge of the rimed version that is to follow. The treatise begins with an exposition of the use of the Arabic (here called Jewish) numerals (vv. 37-89) — how to write them and in what order, the effect of position on their value, and the writing of numbers beyond one thousand — followed by the usual definitions of digit, article and composite (vv. 90-103). After enumerating eight operations of arithmetic (vv. 104-113), the author goes on to deal with each of these operations separately : —

I. Numeration (vv. 114-117).

II. Addition (vv. 118-155).

III. Subtraction (vv. 156-203).

IV. Duplication (vv. 204-229).

V. Dimidiation (vv. 230-267).

VI. Multiplication, in two sections, (*a*) how to multiply one series of figures by another (vv. 268-303), (*b*) six rules for the inter-multiplication of digits, articles and composites (vv. 304-369).

VII. Division (vv. 370-432).

VIII. Progression, i.e. the totalling of arithmetical series (vv. 433-466). Of the nine methods announced in v. 439, only three are explained.

In a quaint epilogue (vv. 467-496) the author emphasizes the value of study and the inexhaustibility of learning. The divisions here adopted are not all indicated in the Ms.; but *Additio*, *Substratio* and *Progressio* have been written, in addition to paragraph signs, against vv. 118, 156 and 433 respectively. The plan of the work agrees fairly closely with that of the well-known treatise written about 1250 by JOHN OF HOLLYWOOD (or Halifax) (5); though vv. 37-89 should have been included under Numeration, and the

(5) JOHANNIS DE SACRO-BOSCO *Tractatus De Arte Numerandi*, edited by J. O. HALLIWELL, *Rara Mathematica*, London, 1839, second edition 1841, pp. 1-26.

final sections on square and cubic root have been omitted. The agreement is not confined to the general plan, but frequently extends even to the wording; a number of extracts from the Latin text have therefore been included in the footnotes (preceded by SB. = SACRO-BOSCO), for the sake of the light which they throw on obscurities in the French. It is well known that the treatise by JOHN OF HOLYWOOD retained its vogue, and remained the basis of arithmetical teaching, down to the Renaissance (6). A comparison of the present poem with the thirteenth century algorism in French verse recently published (7) suggests retrogression rather than progress in the teaching of arithmetic; the fifteenth century work, though better preserved, is less lucid and its methods are even clumsier.

VERSIFICATION. Like most Old French didactic verse, the algorism is written in octosyllabic couplets. In a work of this nature, where artistic perfection was liable to be sacrificed to practical requirements, we may expect to find metrical irregularities. Yet there is no doubt that a great many of the inaccuracies presented by the manuscript are due to defective copying, not to the author. The large majority of the lines scan as normal octosyllables. A certain discretion must be exercised in choosing between elision and hiatus; thus in several instances we obtain a correct line by eliding the final vowel of a word spelt in full : *Che est* 19, 142, *de uns* 87, *Que une* 123, *qui aprés* 138, 400 (cf. 145), *ne un* 227, *Si avrais* (?) 428 (cf. 266), *li hons* 474; or by accepting a hiatus, e.g. : *de arismetique* 7, *nombre est* 91, *article est* 136, *que avrais* 162, *motïe et* 254, *l'estude est* 478. In vv. 476 and 477 we may expand *c'on* as *que on*. The author allowed himself numerous options, especially as regards the counting or omission of feminine *e*, which in his day was becoming, or had become, obsolete in ordinary Walloon pronunciation (8). Pretonic *e* before a vowel is mute in *eust* 421 and *seussies* 472, and similarly in *meisme* 78, 283; yet in v. 26 *meïsme* (: *risme*) counts as three syllables. The imperfect indicative 2 sg. could end in *-oies* (*devoies* 185, *avoies* 266, 322, 428, cf. *avois* : *voies*? 328), *-oie* (*avoie* : *voie* 203), or *-ois*

(6) Cf. L. C. KARPINSKI, *Robert of Chester's Latin translation of the Algebra of Al-Khowarizmi*, New York, 1915, p. 16.

(7) In *Isis*, XI (1928), pp. 45 ff.

(8) Cf. COHEN, *Mystères et Moralités* (see below), pp. LV ff.

(*querois* : *drois* 296, cf. *avois* : *querois* 453). In certain futures an intercalated *e* was optional, e. g. : *prendrait* 28 but *prenderais* 190; *sarait* 32, *avrait* 73, but *saverais* 418. Sometimes it is clear that a supernumerary *e* is due to the scribe, or, if written by the author, had no metrical value for him : *brif(e)ment* 2, *quel(e)* 93, *met(e)rais* 161 (cf. *meterais* 388), *second(e)* 181, *teil(e)* 194, 274, *nonpeir(e)* 255, *aveq(ue)* 262, etc., *donk(e)* 324, *Quant(e)* 407. On the other hand the scribe appears to have omitted a syllable in the following instances, where the addition of feminine *e*, or *-es*, grammatically needed, restores the metre : *promier-e(s)* 82, 83, 250, 306, *tout-e* 115, *trestout-es* 167, *rajoust-e* 199, *quoy-e* 229, *droit-es* 267, *multipli-e-rais* 338, *Quant-es* 390, *cel-le* 396, *cel-es* 401. In *peire* : *nonpeire* 244, etc., *nonpeire* : *osteire* 252, *plaisiere* : *desire* 495, the posttonic *e* may have been added by the scribe. But in a score of instances the author himself appears to have ignored an etymological final or counterfinal *e*, not only after a vowel : *vrai(e)ment* 57, *moitī(e)* 246, *motï(e)* 445 (cf. 254, 256, 456) (9), *multepli(e)* 342, but also after a consonant : *promier(e)-ment* 47, *quart(e)* 109, *figur(e)* 123, 166, *promier(e)* 106 (?), 124, 168, *tout(e) promier(e)* 236, *fair(e)* 249, 495, *tant(es)* 285, *second(e)* or *cel(le)* 284, *tant(es)* 285, *un(e)* 408, *Nul(le)* or *figur(e)* 413, *sciench(e)* (?) 486. That such pronunciations may safely be attributed to the author is finally proved by the rimes *dite* : *s'ensiete* 108, *senieste* : *neste* 216 (cf. *nest* 179), and *compte* : *monte* (subs.) 433, in which etymological and inorganic *e* are combined; or by *just* (: *pust*) 115, where the *e* has been dropped. Similar rimes are plentiful in other Walloon poems of the period. There remain a number of definitely unmetrical lines, almost all of which could be regularized without difficulty. In v. 81 the *s* of *quatres* may be ignored. In vv. 109, 110, 111 and 204 it is possible that the ending *-tion* (dissyllabic in 107, 114, etc.) is monosyllabic; similarly *i* and *e* may perhaps be run together in *conscienche* 20 and *multiplyét* 269 (in spite of *scïenche* 19, *nïent* 61, *multiplyĕr* 304, *conscïenche* 494, etc.). Easy emendations, some of which have been adopted as indispensable to the sense, will add the missing syllable or syllables in vv. 89, 94, 95, 122, 165, 180, 190, 270, 311, 314 (-2), 346, 366, 402 (-2), 403, 423, 464 and

(9) On the dialectal form *moitïe* see 'Vowels' (8) below.

490. Vv. 67, 192 and 271 all very probably corrupt, are not so readily restored. In the absence of any means of control, no attempt has been made to introduce emendations on metrical grounds alone.

The rimes, which are mostly commonplace, are correct according to Liégeois pronunciation of the later Middle Ages. Allowance must be made, in particular, for the decadence of feminine *e* and final consonants. On no fewer than 37 occasions the author rimed a word with itself, without difference of meaning. Two successive couplets have the same rime in vv. 116-9, 134-7, 244-7, 312-5 and 326-9 (?). Vv. 62, 81 and 382 (or 380, if ***faroit*** be corrected to ***farait***) stand by themselves unrimed; deficiencies in the sense indicate that the corresponding lines have dropped out. ***Multiplie*** : ***article*** 352 is a mere assonance, but there is no sign of a lacuna.

THE DIALECT. However little value this algorism may possess as a scientific document or as a literary performance, it well deserves publication as a dialectal text. Its language, as represented by the forms of the Ms. (borne out by the rimes, as a later paragraph will show), agrees closely with that of the Chronicle of JEAN DE STAVELOT (10) contained in the same volume; like the Chronicle, therefore, it represents the dialect used at Liége in the first half of the fifteenth century. Even without the guidance of the remainder of the volume, it would have been easy to identify the dialect of the algorism. Thanks to the work of a number of highly-qualified investigators, notably M. WILMOTTE (11), G. DOUTREPONT (12) and G. COHEN (13), the Walloon dialects of the later Middle Ages are now tolerably well known. Until a later date, it seems, than in any other province, writers of the Liége area continued to use their dialect, influenced but slightly by Central French, for literary and dramatic purposes. In compiling the following summary of the dialectal features of the algorism, I have utilized especially the publication of M. COHEN; the tho-

(10) Edited by A. BORGNET (see above).

(11) *Etudes de dialectologie wallonne*, in *Romania*, XVII, XVIII and XIX.

(12) *Etude linguistique sur* JACQUES DE HEMRICOURT *et son époque*, in *Mémoires couronnés* ... publiés par l'Académie Royale ... de Belgique, XLVI, 1892, n° 5.

(13) *Mystères et Moralités du Manuscrit* 617 *de Chantilly* (*Bibl. du XV^e siècle*), Paris, 1920.

roughness, the systematic arrangement and the recent date of his Introduction make it particularly convenient for reference.

Vowels.

(1) The product of V. Lat. free tonic *a* is normally *ei*, e.g. : *nommeis* 6, *compteir* 12, *adjosteit* 154, *teile* 194, *peire* 243, *uniteit* 258, *remeise* 419, *seit* (*sapit*) 481; except when preceded by yod (e.g. *sachies* 101, *multiplyét* 269, *avanchier* 302) or followed by fem. *e* (e.g. *ostee* 232, *menee* 278). Other exceptions are *adjosté* 153, *unité* 180, and perhaps *regardé* (for *-deir*) 313.

(2) *an* and *en* are kept distinct, the only exception being *manrais* 282 (but *menrais* 286).

(3) *ai* is occasionally reduced to *a* : *afature* 38, *fat* 69, *lasseras* (?) 169; and French tonic *a* is sometimes represented by *ai* : *pais* 164, 233, *ais* 426 (14). In futures, 2 and 3 sg., *ai* is usual, e.g. *prendrait* 28, *vorait* 30, *deferais* 142, *avrais* 162; but exceptions are fairly frequent, e.g. : *sera* 77, *avras* 89, *venra* 259.

(4) *au* is occasionally reduced to *a* : *faroit* 381, *acunne* 419; but *autre* 16, *altre* 123, *aultres* 126, *vaut* 180, etc. Conversely *au* is written for *a* in *debautre* 15; cf. *abautre* in Stavelot's Chronicle, p. 367, l. 26, *daute* ibid., p. 127, l. 11, etc.

(5) Blocked tonic open *e* appears to be diphthongized in *diestre* 128, 232, 397, *seniestre* 206, 276, 378, *tieste* 485, *molieste* 486; but *appelle* 10, *aprés* 27, *estre* 277, etc. There is one instance of *ei* : *seneistre* 233; cf. *deis* 85. We find *ie* and *ei* for *e* occasionally in pretonic position also : *viereis* 35, *dieraines* 48; *teis* (*tuas*) 409.

(6) Initial *as-* for *es-* : *astoit* 212, 332; but elsewhere *estoit*, *estuet*, etc.

(7) Closed *e* + *l* + consonant produce *eau*, not *eu* : *eaux* (*illos*) 130, 323, etc.

(8) *ie*, being a descending diphthong, not ascending as in Central French, is sometimes reduced when internal to *i* : *brifement* 2, *manire* 194, perhaps also *vint* (for *vient*?) 68. Conversely *ie* is written for *i* : *chemien* 297, *plaisiere* 495. When final, *ie* becomes *ïe* : *moitïe* 256, *motïe* 254, 456, and the feminine *e* could be ignored in the counting of syllables (15).

(14) According to E. G. Wahlgren, in *Mélanges Vising*, Göteborg and Paris, 1925, pp. 290 ff., this *ai* represents open *e*.

(15) See 'Versification' above.

(9) *ein* has become *ain* : *amaine* 126, *maine* 329, *plain* 479, *plaine* 485; it has not become *oin* in *mains* 186, 187, 341, 376 (but *moins* 84).

(10) Pretonic *e* is always rounded in the word *promier* 44, etc., cf. *promierement* 47, *promerain* 333, 393. The scribe sometimes wrote the *pro-* in full, more often used a contraction.

(11) The capricious treatment of feminine *e*, which is added or omitted at random, and of vowels in hiatus, is discussed in the sections on Versification and Rimes.

(12) The product of V. Lat. free tonic open *o* is written *ue* : *puet* 98, etc., *estuet* 99, etc.; but the spellings *vuet* 319, *vues* 455 suggest *œ* as the pronunciation. A preceding *v* absorbs the *u* in *aveque* 328, etc.; the spelling *avoit* 358 may be a mere corruption. *Lieu* (*locum*) 67, etc., is the standard French form.

(13) Tonic *oi* is reduced to *eu* (presumably *œ*) in *valeur* 213 (the normal modern Liégeois infinitive); but *savoir* 24, *valoir* 67, etc. Pretonic *oi* is reduced to *o* in *motie* 244, 254, 445, 456, 457, but remains intact in *moitie* 231, 246, 256, 451, 463, and other words. On the other hand tonic *o* is represented by *oi* in *toist* 33, 356, *tantoist* 369, 458, 472, *hoir* 159, *conpoist* 357, and similarly pretonic *o* in *repoiseit* 163; but *tantost* 21, *dehors* 95, *compost* 342, etc. (16). In the numeral *oit* (the Walloon form from *octo*) the diphthong has become two separate vowels with a labial glide : *ouwetemme* 113 (cf. *ou viii* 104?).

(14) Free tonic closed *o* gives *eu* : *deseur(e)* 169, 178, etc., *meneur* 316, *songneux* 473, *convoiteux* 474; but *menour* 425. The numeral *dois* (*duos*) 52, etc., is probably influenced by *trois*.

(15) *ui* is reduced to *u* in *pust* 114, but not elsewhere. It undergoes metathesis in *pius* 182, 287, 323, 356, 364, 401, 427, the *i* being picked out by an accent in nearly every instance; but *vuis* (**vocitus*) 299, also with the *i* accented.

(16) *on* is substituted for *un* in *commonement* 46, *casconne* 54, 63, *alcons* 59, *on* 231. There is no reliable instance of *un* for *on*; *summe* 47 may be a Latinism.

Miscellaneous. The conjunction *mains* 50, 59, 95, et passim, still the normal Liégeois form, is probably due to contamination of *mais* and *ains*, not to progressive nasalization (17); *magis* used

(16) The phonetic significance of this *oi* is discussed by WAHLGREN, *op. cit.*, pp. 311 ff.

(17) Cf. COHEN, p. LIV.

adverbially gives *mais* 467 or *mes* (?) 399. Note *pou* (*paucum*) 9, 368, *reclout* (*reclaudit*) 20, *chouse* (*causa*) 419, and *ie* for *ieu* in *ensiete* (**insequit*) 109. There is only one doubtful instance of the omission of prosthetic *e* before *s* + consonant : *studoier* 473 (cf. *est-* 492).

Consonants.

(1) Vocalized *l* falls not only after *i* (*subtis* 5) as in Central French, but also after *a* and *e*, e.g. in the contractions *al* and *del* (see Declension). The suffix *-ellus* is represented by *joweais* (**jocellos*) 480; cf. the forms *beais* (*bellos*), *cheais* (*ecce-illos*), etc., presented by other texts in the same Ms.

(2) *l*-mouillé is normally represented by *lh*, a characteristic Walloon spelling : *subtilh* Prol., *ilh* 31, *milhier* 71, etc.; cf. Cohen, p. xiv, 16.

(3) Final unsupported *t* is commonly preserved after an accented vowel, e.g. : *at* 21, *subtiliteit* 22, *prendrait* 28 (and other futures), *fut* 45, *multiplyét* 460, *entendut* 469, *vuidiet* 487; but exceptions are fairly numerous, e.g. : *trova* 44, *a* 104, *appellera* 105, *adjosté* 153, *unité* 180. In *appellet* 62 the preservation of the *t* after posttonic *e* is due to the inverted combination with *on*; cf. *appelle* 10, *fache* 187, *multiplye* 307, etc.

(4) Between *n* and *r*, *l* and *r* there is no glide *d* : *convenrait* 29, 424, *-ra* 78, 305, *vorait* 30, *vora* 304, 368, *venrait* 130, *-ra* 344, *revenrais* 191, *remanra* 258, *faroit* 381, *menre(s)* 383, 420.

(5) *c* before *a* remains unchanged in *casconne*, *-unne* 54, 63, 353, 380; but we find *ch* in *conchiet* 488.

(6) V. Lat. *c* before *e*, *i*, and *t*, *c* + yod are represented either by *ch* : *ch'* 3, *scienche* 8, *cheli* 12, *ychi* 64, *recommenchier* 79, *tierche* 108, *fache* 187, etc.; or by *c* : *ceu* 2, *certainement* 3, *celle* 9, *cent* 69, etc.; and in one instance by *s* : *espises* 104. The Arabic word *cyfre* normally has *c*; but *chiffre* 38.

(7) The final *c* which is usually added to *un* (indefinite article and numeral), doubtless indicating nasalization of the vowel, is frequent in Liégeois texts.

(8) A glide *w* has developed in *Juwis* Prol. (but *Juys* 43, 45), *ouwetemme* 113, and *joweais* 480.

(9) Mute consonants. The decadence of final *s* and *t*, though not strictly a dialectal trait in the fifteenth century, is a striking feature in this and contemporary Liégeois texts, producing as

it does utter confusion in the endings of words. Thus not only is *s* dropped (*thier* 69, *vou* 467) and *t* dropped (*comp* 46, *tou* 50, *secon* 68, *compos* 92, 98, etc., *gran* 101), but *t* is substituted for *s* (*fait* 2 sg. 341) and *s* for *t* (*fais* 3 sg. 52, *dois* 3 sg. 214). In *escript* 141 an inorganic *t*, as well as etymological *p*, has been added to the imperative 2 sg. The fall of *s* before another consonant is illustrated by *puit* 270, *toudis* 495. The spelling *traitier* 28 for *-tié* suggests that final *r* was mute, at least in this suffix.

Declension.

(1) Relics of the two-case system. The declension system seems to have been preserved down to a relatively late date in north-eastern France; but flexional *s* was bound to lose its value in Middle French, owing to the decadence of final consonants. In the algorism there is great confusion of case-forms; but some recollection of the two-case system certainly persisted at Liége at the time when it was written down. Whole phrases sometimes appear in their Old French form, or very nearly so, e.g. : *Quant tes nombre serait fais tos* 295, *ses lieu vuis est* 299, *li plus grans dois* 314, *tos tes nombres* 340, *si fais menres est* 420. Adjectives and participles used predicatively are sometimes given *s* : *subtis* 5, *renommeis* 5, *nommeis* 6, *osteis* 159, *grans* 421. Nominative *s* appears to be added for metrical reasons to *articles* 92, 96, 139 (cf. 136, 217), and for the sake of rime to *mos* 93, *biens* 101, and *drois* 297; cf. *fois* 53. *Juwis* Prol., *Juys* 43, 45, has nom. *s* in each instance. *Ons* (*homo*), used as indefinite pronoun, usually has analogical *s*, cf. *li hons* 474; but *on* 34, 62, 96, 98, 101. In many instances, however, the choice of form appears to be purely haphazard, e.g. : *tous nombre* 91, *les promier dois* 129, *dois nombre parfais* 161, *de trestos clain* 480; *le dois* 321 but *le doit* 322; *tes nombres* 345 but *ton nombre* (nom.) 350; fem. *additions* 118 (cf. *li fins* 444) but *subtraction* 156, *grant* 171 but *grans* 172. *Meneur* 316, 377, *-our* 425, occurs in accusative use only, *menre(s)* as predicate 383, 420, and as accusative 317. Other relics of the two-case system will be found in the pronouns and definite article.

(2) Analogical feminines. Only *grant* 47, 171, 450, and *grans* 172, 174, 176, occur as feminine forms, not *grande*. The addition of *e* to *teile* fem. 274, 392, *peire* and *nonpeire* passim, has no significance; cf. *quele* masc. pl. 93.

(3) Definite article. Masc. sg. nom. *li* 43, *ly* 7; acc. *le* 30, *l'* 10, *li* 446 (the only instance); pl. nom. *les* 120; acc. *les* 11, *le* 329. Fem. sg. nom. *la* 82, *le* 124, *li* 112, 231, 411, 444, *ly* 51, 106, 113, 258; acc. *la* 38, *l'* 38, *le* 13, 168, 244, etc.; pl. nom. *les* 48; acc. *les* 81, *le* 83.

(4) Preposition + definite article. With *a* : masc. sg. *al* 87, 137, 186, *a* 333; fem. sg. *a la* 453, 486. With *de* : masc. sg. *del* 157, 347, *de* 374, 420; + vowel, *del* 221, 317, 321, 327, *de l'* 10, 149, 358, 360, 361; pl. *des* 260, etc., *de* 16, 146, 177; fem. sg. *de la* 179, 451, *del* 8 (cf. *del summe* in Stavelot's Chronicle, p. 361, l. 21), *de* 246, 256, 450; pl. *des* 430, 456, 461, *de* 14. With *en* : masc. sg. *ou* 259; + vowel, *en l'* 489; fem. sg. *en la* 27, 138, 293.

(5) Personal pronouns. Sg. 1 *je* 496; dat. *me* 121; 2 *tu* 134, etc., *t'* 199, 203, 209; acc. *t'* 251; dat. *t'* 405, accented form *toy* 429; 3 masc. *ilh* 31, 421, 449, 485, 488; acc. *le* 482 (?); dat. *li* 484; fem. *elle* 59, 68, 85, 300 (?), *ilh* 65, 72, 176, 244, 245, 253; acc. *le* 20, 29, 31, etc., *l'* 21, etc. (*len* 40 is doubtless corrupt), accented form (after prep.) *li* 22, 299, 465, *ly* 58, 141, 228; dat. *li* 279; neut. *ilh* 37, 87, 100, etc., *il* 140; acc. *le* 432, 496. Pl. 1 acc. *nos* 494; dat. *nos* 493; 2 *vos* 35; acc. *vou* 467; dat. *vos* 53; 3 masc. *il* 122, *ilh* 132; acc., accented form, *eaux* 130, 323, etc.; fem. acc. *les* 417, *le* 289, 406.

(6) Possessives. Note *tes* masc. nom. sg. 295, 340, 345 (but *ton* 350); *ton ovrangne* (fem.) 430; *se* fem. sg. 189 (but *sa* 20, 28); *no* fem. sg. 381.

(7) Demonstratives. Pronominal : masc. sg. nom. *chis* 44, 98, *chil* 165, *cheli* 162; acc. *cheli* 426; fem. sg. nom. *celle* 9, etc., *cel* 394, 396, *chil* 172; acc. *celle* 182, etc., *cel* 190, 287, 391, *chel* 393, *cheli* 78, 133, 169, etc.; pl. acc. *celes* 402, *cel* (?) 401; neut. sg. *che* 19, etc., *ch'* 3, 441, *chu* 399, 428, 448, 454, 466. Adjectival : masc. sg. nom. *cel* 28; acc. *ceu* 2, *che* 134; pl. acc. *ches* 102, 372; fem. sg. acc. *cheli* 25; pl. acc. *ches* 117, 415.

(8) Relative pronoun. Nom. sg. *qui* undergoes elision in 145, 179, 212, 332 (?).

(9) Numerals. *Dois* 'two' is invariable, probably on analogy of *trois*. Similarly *andois* 344. Note the ordinal ending *-emme* : *disemme* 57, *septemme* 112, *ouwetemme* 113.

Conjugation.

(1) On the future endings *-ais* (2 sg.) and *-ait* (3 sg.) see 'Vowels' (3).

(2) The 2 pl. ending for the indicative present, imperative and future is always *-eis* : *viereis* 35, *porseuereis* 36, *veis* 40, *deveis* 90, *meteis* 273, *aveis* 469, 470.

(3) The imperative 2 sg. *ramenche* 409, from *ramener*, is doubtless an analogical form, possibly based on *commenche*.

(4) Intercalated *e* is found in the futures *porseuereis* 36, *prenderais* 190, 418, *meterais* 388 and *saverais* 418. The conditional *esseroit* (Ms. *efferoit*) 243 is too uncertain to be taken into account.

(5) The future of *avoir* and *savoir* hesitates between the forms with and without *v*, e.g. : *avrait* 73, *avras* 89, but *sarait* 32, *aras* 155, *sara* 369, etc. The *v* may be regarded as consonaotal (Ms. always *u*), in view of *saverais* 418; but for the scribe it was probably mute, hence the spelling *yuras* (for *iras*) 251.

(6) On futures without a glide *d* see 'Consonants' (4).

(7) Imperfect subjunctive *fuissent* 431, but *eust* 421, *seussies* 472.

Miscellaneous. The usual analogical terminations are becoming normal in the 1 and 2 sg., viz. 1 sg. in *-e* : *cuide* 490, *desire* 496; 1 sg. in -s : *dis* 23, 40, 53, 93, 387 (but *di* 64); imperat. 2 sg. in *-s* : *refais* 150, 175, *fais* 151, etc., *defais* 174, *mes* 186, etc., *prens* 180, etc., *vas* 223, 263, 323, *fiers* 241, *pars* 463 (but *met* 166, 167, *[de]fay* 192, *refay* 193, cf. *refait* 291, *fait* 341). In the imperfect indicative 2 sg. *-oies* and *-ois* are used concurrently; see 'Versification'. Analogical *-e* in the present subjunctive is represented by *donne* 493 and perhaps *voise* 482; but a number of old forms are preserved : *puist* 114, 373, 395, 471, *puit* 270, *comment* (for-*nst*) 206, *demeurt* 489. In these developments there is nothing distinctively Walloon.

The Rimes. It is clear that the algorism, as it stands in the Ms., is written in the Liégeois forms that Jean de Stavelot himself used. But we can hardly believe that it was his own composition. Would he have permitted his own work to be disfigured, as this is, by corruptions and omissions, only the more flagrant of which are corrected or pointed out in the present edition? Would he have omitted the example which is clearly required after v. 77? Stavelot was not incapable of perpetrating verse,

witness the rimed insertions in his Chronicle (18); but in this instance we must assume that he was transcribing the work of some other author (19). The linguistic evidence indicates, however, that the original author was not far removed from JEAN DE STAVELOT in either place or time. A study of the versification has proved that the scribe, in his capricious treatment of feminine *e* and vowels in hiatus, was merely exaggerating tendencies already shown by the author. A study of the rimes leads to a similar conclusion. Although they are of a hackneyed and obvious nature, often identical or consisting of words from the same root, with many repetitions, they nevertheless suffice to show that the author's dialect agreed completely with that of the scribe. Thus *en* and *an* are kept distinct; *au* before a consonant is reduced to *a* (*debautre*: *autre* 15, for *debatre* : *atre*); the diphthong *ie* becomes *ïe* (*moitie* : *multiplie* 451,457, *moities*: *parties* 463) or is reduced to *i* (*s'ensiete* (20): *dite* 109, *promiere* : *dire* 124); *ein* becomes *ain* (*amaine* : *deraine* 126, *plain* : *clain* 479); *oi* and *o* are confused (*remanoir* : *hoir*, for *hors*, 159 (21)); *ui* is reduced to *u* (*pust* : *just* 114, *cuide* : *estude* 476, 490); and *on* and *un* are confused (*deson* : *un* 284). Unsupported and supported *t* are rimed together (*estudiet* : *siet* 483). *Dois* 'two' rimes with *dois*, from *debes*, 132, 146. On some points the rimes are inconclusive; thus *ei* from free tonic *a* rimes only by itself (e.g. *nonpeire* : *osteire* 252) and with the 2 pl. ending *-eis* (*uniteis* : *meteis* 272); similarly the futures in *-as*, *-a* or *-ais*, *-ait*, and the pronoun *eaux* (*illos*) rime only by themselves. *Estoit* (: *doit*) 278 and *astoit* (: *doit*) 332 may represent *estait*, ind. pr. 3 sg. of *ester*, thus giving rimes of *ai* with *oi*; but they may equally well be the imperfect of *estre*, the imperfect being often used irregularly in this text. The diphthongization of blocked open *e* is not borne out by the rimes, cf. *diestre* : *mestre* 397 (*diestre* : *seneistre* 232, *seniestre* : *estre* 276, 378, and *tieste* : *molieste* 485 are inconclusive); but Walloon poems show great hesitation in the treat-

(18) ed. BORGNET, pp. 368 and 384.

(19) GACHET, *op. cit.*, p. 186, left the question of authorship open: 'Nous serions fort embarrassé pour dire la part qui revient à JEAN DE STAVELOT dans ce traité compilé par lui.'

(20) *Ensiere* (**insequere*) is a Walloon form; cf. M. WILMOTTE, in *Etudes romanes dédiées à Gaston Paris*, Paris, 1891, p. 241.

(21) Cf. *espoir*: *confoir* (= *confort*) in STAVELOT's *Chronicle*, p. 368; *lhoirs* (= *lors*): *fors* (= *forts*), ibid., p. 373.

ment of this vowel (22). The dialectal developments listed under 'Consonants', though not as a rule confirmed by the rimes, are in no instance contradicted. The peculiar imperative *ramenche* 409 rimes with *commenche*. That the algorism was not composed until late in the Middle Ages is indicated by the breakdown of declension, the analogical developments in conjugation (*cuide* : *estude* 476, 490; *dis* : *dis* 'ten' 40, but *di* : *autresi* 64; *querois* : *drois* 296, but *avoies* : *voies* 266), the haphazard treatment of feminine *e*, and the extraordinary confusion prevailing among final consonants. To the illustrations of this last feature already mentioned under 'Consonants' may here be added others guaranteed by rimes. Final *s* is ignored in rime (*ensengnement* pl. : *aprent* 11, *figure* pl. : *afature* 37, *desu* : *tu* 391, *qui* : *li* 466), or arbitrarily added (*fois* sg. : *trois* 53), or replaced by *t*, both consonants being mute. *Doit* (: *estoit*) 279, *refait* (: *fait* subs.) 291, *fait* (: *fait* 3 sg.) 341 and *porat* (: *at*) 440 must all be interpreted as 2 sg. forms; whereas *ferais* (: *avrais*) 325 is a 3 sg. form, with the converse substitution of *s* for *t*. Whether *compos* : *mos* 92 and *est* : *mes* 220, 288, 299, were intended to be rimes in *s* or *t* is difficult to determine. There is less evidence to prove that final *r* was mute; but *avoir* (: *valoir*) 271, if not corrupt, may be interpreted as an imperfect indicative 3 sg. That *s* before a consonant had fallen from pronunciation is shown by the riming of *risme* (O. Fr. rime) with *meïsme* 25, and by *comment* for *-nst* (: *seulement*) 206. In *senieste* (: *neste*) 26 for *-estre*, the *r* becoming final has fallen as well as the posttonic vowel (23). We may therefore conclude that in all probability the author of the poem belonged to the same place and period as the scribe, viz. Liége in the first half of the fifteenth century.

SYNTAX. Attention may be called summarily to a few interesting features.

(1) *Qui* used indefinitely introduces a conditional clause : vv. 2, 30, 102, 304.

(2) *Com* (*quomodo*) is virtually equivalent to a relative pronoun in vv. 155 and 328; but not in v. 218, though the circumstances seem similar.

(3) Reflexive verb with passive sense : vv. 156, 214-5, 255-6.

(22) Cf. COHEN, p. XXXIII.

(23) Cf. COHEN's examples, pp. LVI f.

(4) *Se* 'if' followed by present subjunctive : vv. 146-7, 218-9.

(5) Compound tense of a verb of motion formed with *avoir* : vv. 202, 267, 297.

(6) *Voloir* + infinitive as circumlocution for the future : vv. 31 (?), 319.

(7) *Devoir* with ellipsis of a following infinitive (*estre*?) : vv. 122, 396.

(8) *Pooir* with ellipsis of a following infinitive (*faire*?) : v. 376.

(9) Parataxis : vv. 491-3.

THE TEXT. The Ms. has been accurately reproduced, with occasional corrections suggested, or rather demanded, by the sense. A few words and letters added to the text have been enclosed in square brackets. All other departures from the Ms., even in the division of words, are indicated in the footnotes. The usual liberty has been taken in modernizing *i* and *j*, *u* and *v*, and in accenting *e* when there is a possibility of confusion with the unaccented vowel. The letters *b* and *v*, as written by JEAN DE STAVELOT, are sometimes difficult to distinguish. The expansion of contractions offers no difficulty. The sign ⁹ has been resolved as *com* before a labial consonant (*compte* 16, *commonement* 46, *compos* 132, etc.), in spite of several examples of *con* written in full (*conpos* 309, 311, *conpost* 352, *conpoist* 357); similarly the nasal bar has been resolved as *m* in *nombre* 1, *com* 35, *disemme* 57, *ensemble* 119, etc. (cf. *nombre* 7, *compteir* 12, *ensemble* 39, etc., written in full). All expanded letters are italicized.

Miss M. K. POPE, who possesses exceptional experience in the treatment of Old French dialectal texts, has kindly read both the text and the introduction in manuscript, and made a number of helpful suggestions. I take this opportunity of thanking her warmly.

Chi aprés s'ensyet la noble et subtilh scienche qui est appelleit le compte de algorisme, p*ar*t*an*t que chis qui le fist avoit nom Algorisme, qui estoit uns Juwis.

Algorisme si est .i. nombre. fo. 210b
Qui brifement conte et met ceu nombre,
Ch'est .i. compte certainement
Qui en nul fait certain ne ment,
Qui mult subtis est renommeis,
Et si est aultrement nommeis
Ly nombre de arismetique.
Del scienche mathematique
Desquent, et celle qui pou vaque,
Que ons appelle de l'abaque
Les tres nobles ensengnement.
Et cheli a compteir aprent
Et a nombreir par le jointure
De .ix. et le cyfre figure,
Et multiplyer sens debautre
L'un de compte tot parmi l'autre,
Et departir, et deviseir,
Et l'un de l'autre enssi sevreir.
Che est une mult noble scienche.
Qui le reclout en sa conscienche
Si l'at tantoist en haste apris,
S'en li subtiliteit a pris.
Si vos dis et fay assavoir,
Qui algorisme vuet savoir,
Si entende bien cheli risme
Parfaitement, et le meisme
En aprés jusques en la fin,
Ou cel traitier prendrait sa fin;
Car tout le convenrait savoir,
Qui le profit vorait avoir.
Et s'ilh le vuet bien retenir,
Bien sarait dire sens mentir
Mult de comptes, et toist leveir
Come riens c'on poroit penseir,
Si com chi aprés vos viereis,
Et vos bien le porseuereis.
Ilh n'y at plus que .ix. figure
Et la chiffre por l'afature,
Qui font trestout ensemble .x.

Here follows the noble and subtle science which is called the calculation of algorism, for the reason that he who invented it was named Algorism (he was a Jew).

Algorism is a system of numbering. If one employs that system when reckoning rapidly, without doubt it is a form of reckoning which tells no lie on any exact point; it has a high reputation for accuracy, and is otherwise known as the system of arithmetic. It forms part (?) of mathematical science, as also does that branch which is seldom idle (?), called the very noble teachings of the abacus. The present branch teaches how to reckon and to calculate by means of the combination of the nine figures and the cypher, to multiply one set of figures by another without contestation, to split up, and to divide, thus separating one from the other. It is a very noble science. He who encloses it in his mind has forthwith speedily learnt it, if he has acquired accuracy in the use of it. I tell you and inform you, then, that he who wishes to know algorism should listen carefully to this poem, and continue to do so until the end, where this treatise will terminate; for he who wishes to profit by it must know the whole of it. And if he will remember it well, he will be able to carry out many reckonings without a mistake, and to effect (?) them with the greatest imaginable speed, as you shall hereafter see, provided you do not relax your attention.

The apparatus consists merely of nine figures and the cypher,

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1. *Large capital* G *in error for* A. 9. Desquent et *corrupt? or a lacuna?* 10. *Ms.* la baque. 25. *Ms.* tisme.

Veis le chi, enssi que je dis :
0 9 8 7 6 5 4 3 2 1.
A reculons le doit ons lire,
Enssi com li Juys escrire;
Car chis qui promier le trova
Juys fut quant l'aconstuma.
Enssi comp[te] ons commonement
La plus grant summe promierement.
Enssi les figures dieraines
Font mult plus que les devantraines.
Mains de che soies tou certain :
Ly promier a la bonne main
Fais .i., l'autre dois, l'autre trois; fo. 210c
Et je vos dis en bonne fois
Que casconne figure fait
Tant qu'a son nombre at son tour fait
Jusques a .ix. tant seulement.
La cyfre est disemme vraiement,
Qui par ly seule ne valt riens,
Mains elle valt en alcons biens,
Ou tient le lieu tout seulement;
S'at nom figure de nient,
Ou cyfre, ensi l'appelle-t-on...
Casconne figure autresi
Fait tant com ychi je vos di;
Car quant ilh est a promier mise...
Si fait .x. tant, et s'a devise
Que valoir en promier lieu
Quant elle vint en secon lieu;
Et en thier lieu fat tant de cent
Qu'en promier lieu valt proprement;
Et en quart lieu tant de milhier
Con ilh valoit tout a promier.
Quant plus de .x. ons y avrait,
Si vos diray que ons ferait :
Ons comptera jusques a quatre;
Adonc covient que trois de quatre
Faire, et escrit ensi sera:...
A cheli meisme convenra

making ten in all. Here it is, just as I say : 0 9 8 7 6 5 4 3 2 1. It must be read backwards, and written just like a Jew writes; for he who first invented it was a Jew when he brought it into use. Thus the largest number is commonly counted first [*i.e.* when read in the ordinary way]. Thus the last figures are of much higher value than the first. But be quite sure of this : the first figure on the right represents one, the next two, the next three; and I tell you in good faith that each figure represents its respective number up to nine and no farther. The cypher indeed comes tenth; by itself it is worth nothing, but it is useful for certain purposes, or merely occupies the position. It is named the figure nought, and is also known as cypher... Each figure likewise represents the amount that I here tell you; for when it is placed first, ... and in the third position it represents a hundred times as much as it is actually worth in the first position; and in the fourth position a thousand times as much as it was worth at the beginning. When more than ten (?) [figures] occur in a number, I will tell you what must be done : one must count [the figures] up to four, then make three from four [*i.e.* separate the first

40. le] *Ms.* len. 45. *Ms.* la constuma. 46. *or* comp[t]ons ? 64. voy *corrected to* vos. 65-8. *Passage corrupt.* 73. x] *corr.* iii ? 76. covient que] *corr.* covenra ? 77. *Ms.* escrire.

Recommenchier a racompteir,
Et jusques a quatre compteir,
Et por les quatres adés trois faire;
Et la promier qui serait
Sor le promier trois ferait
Ne plus ne moins tant de milhier
Com elle fait deis a promier;
Celle aprés fait tant de .x. mil
Com ilh at de .i. al promier mil.
Ensi toute les priseras,
Tant com adés en avras.
Aprés si deveis vos savoir
Que tous nombre est dois par voir,
Ou articles est, ou compos;
Et quele sont vos dis a brief mos :
Dois [est] tos nombres jusqu'a dis,
Mains que .x. soit dehors mis.
Articles est c'on puet partir
En .x. pars sens riens retenir.
Nombres compos est chis c'on puet
Deviseir en .x., et s'estuet
Qu'ilh ait aveque alcunne riens.
Et sachies c'on en at gran biens,
Qui ches nombre connoistre puet,
Et tresbien savoir les estuet.
Ly nombre .viii. espises a,
Que ons ensi appellera :
Ly promier numeration, fo. 210d
Et la seconde addition,
Subtraction la tierche est dite,
La quarte duplication s'ensiete,
La quinte dimidiation,
La sexte est multiplication,
Division est li septemme,
Progression est ly ouwetemme.
[I] Numeration est c'on pust
Tout riens compteir, et bien just,
Tout che que ons poroit penseir,
Et par ches figures nombreir.

three], and write the number thus : . . . ; at that same figure [*i.e.* the fourth] one must begin counting again, count up to four, and forthwith make three for the four; and the first figure which follows the first three will represent a thousand times as much, neither more nor less, as it represents at the beginning; the following figure represents ten times as many thousands as there are units in the first thousand. Thus you must value them all, so long as you have any left.

Next you should know that every number is a digit indeed, or it is an article, or a composite number; and I will tell you briefly what these are : A digit is every number up to ten, provided ten be excluded. An article is a number which one can divide into ten parts, without having anything left over. A composite number is that which one can divide into ten, and something more must accompany it. And know that if one can distinguish these numbers, one derives great advantage therefrom; and they must be known thoroughly.

The science of numbers includes eight operations, which must be named as follows : the first numeration, the second addition, the third is called subtraction, the fourth duplication comes next, the fifth dimidiation, the sixth is multiplication, division is the seventh, progression is the eighth.

I. Numeration is that one may be able to count and number by means of these figures, with great precision, everything imaginable.

Line missing after 81*?*

104. *Ms.* ou .viii. = ouwet (*cf.* 113) *?* 110. *Ms.* diuidiation.

[II] Additions fait adjousteir
Et *com*pteir ense*m*ble, no*m*breir
Co*m*bien les dois vale*n*t ense*m*ble;
Et aprés covie*n*t, che me se*m*ble,
Qu'il [soient] .i. no*m*bre. Et enssi doit
Que une figure sor altre soit,
Le p*r*omier sour l'autre p*r*omiere;
Aprés, c'o*n* doit seco*n*de dire;
Et les aultres ensi amaine
Jusqu'a la .ix.^{e} et deraine.
Et a diestre *com*me*n*chier dois,
Et adjousteir les p*r*omier dois,
Et li no*m*bre qui d'eaux ve*n*rait
Ou dois ou article ferait,
Ou *com*pos. Ou s'ilh ne sont dois,
Cheli desous defaire dois,
Et en che lieu dois tu refaire
Unc, qui les dois deva*n*t apaire.
[S']article est, si dois tu faire
Unc al p*r*omier, ou altre faire
En la figure qui aprés est;
Li doit donc ly articles est.
Et s'il avient que cyfre soit,
En lieu de ly escript le doit;
Se che est .ix., si le deferais,
Et en son lieu cyfre ferais;
Le droit *com*pte faire *con*vient
En la figure qu'aprés vient.
Et se li no*m*bre de dois dois
Soit *com*pos, p*r*omier faire dois
Le dois qui est oultre l'article;
Et le dois qui est de l'article...
Et la figure aprés refais,
Ans les dois dois en ap*r*és fais.
Tous les aultres adjosteras
Co*m* les p*r*omiers adjosté as.
Qua*n*t ensi avras adjosteit,
S'aras che co*m* as dema*n*deit.
[III] Subtraction se fait osteir

II. Addition enables one to add and count together, to reckon how much two numbers are worth when put together; and afterwards it is necessary, so it seems to me, that they should form one number. It is essential that one figure should be placed over another, the first of one number over the first of the other; next one should put the second; and bring the others thus in their order down to the ninth and last (?). You should begin on the right and add together the first digits, and the number produced by them will make either a digit or an article or a composite. If the number does not consist of two figures [*i.e.* if it is less than ten], you should cancel the under figure, and in its place set a single figure which combines the two previous ones. If it is an article, you must write a one first, or alter the following figure; the digit is then the article. And if it [*i.e.* the next figure] happens to be a cypher, write down the digit in its place; if it is a nine, you must cancel it, write a cypher in its place, and make the correct adjustment in the figure which comes next. And if the sum of the two digits is a composite, you should first write down the digit which follows the article; and the digit which forms the article itself.....; alter the following figure, and then write down both the digits. You must add all the others in the same way as you have added the first ones. When you have added up in this manner, you will have what you wanted.

III. Subtraction enables one to deduct a second number from

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118. Additio *in right margin*. 120. *Ms.* Com bien (*et passim*). 132. Ou s'ilh] *corr.* Et s'ilh *or* Or s'ilh ? 133. *Ms.* de faire. 141. *Ms.* En luy ne ly; *cf. SB.*, p. 6, *l.* 17 : *loco illius deletæ scribatur digitus articuli*. 144. *Ms. com*pte est faire. 156. Substratio *in right margin*.

Del nombre .i. altre, et pius *com*pteir
Combien ilh poroit remanoir
Quant li nombre osteis serait hoir.
Et a diestre commencherais : fo. 211a
Dois nombre parfais y meterais,
Et cheli que avrais osteit
Soit trestos desous repoiseit;
Et si ne doit pais si grans estre
Com chil de deseur puet estre.
Une figure sor altre met,
Et ensi trestout les met.
Le promier desous osteras
De cheli deseur. Lasseras...
La figure qui desous est
Ou plus grant ou plus petite est,
Ou enssi grans com chil estoit
Qui pardeseur escript estoit.
Se si grans est, si le defais,
Et en son lieu cyfre refais.
S'ilh est plus grans, osteir en dois...
Une figure de dois dois.
Se celle deseure menre est,
De la figure qu'aprés nest
Prens [une] unité, qui vaut .x.,
Por che qu'en seconde lieu l'as pris;
Celle desous pius osterais,
Et le ramanant referais.
Et s'ilh avient que ilh ait .i.
Dont si devoies prendre l'un,
Si l'oste, et cyfre y mes al mains,
Que celle aprés ne fache mains.
Et s'ilh avient que cyfre soit
La ou se jointe prendre doit,
Et cel aprés prenderais;
Et quant ariere revenrais,
Chascunne cyfre defay,
Et aprés .ix. devant refay.
La seconde oste en teile manire
Com tu as osteit la promiere.

the first, and then to reckon how much may be left when the number is taken away. You must begin on the right : you must write down there two entire numbers, and the number which you are going to take away must be set underneath in its entirety; it should not be so large as the number above. Put one figure over another, put them all thus. You must take away the first under number from the one above. You must leave ..... The figure which is beneath is either greater or less than, or equal to, that figure which was written above it. If it is equal, cancel it, and write a cypher in its place. If it [*i.e.* the upper figure] is greater, you should take from it..... one figure from the two digits. If the figure above is less, take from the figure which comes after it a unit, which is worth ten because you have found it in the second position; then you must take away the figure below, and write down the remainder. And if it happens that there is a one from which you had thus to take the one, remove it, and put a cypher there at least, lest the following figure should lose its value. And if it happens that there is a cypher where it [*i.e.* the subtracted figure] is to find its augmentation, then you must take the figure which follows; and when you come back again, cancel each cypher, and then write nine in front of it. Take away the second figure in the same manner as you have taken away the first.

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158. *corr.* porait ? 176-7. *cf. SB., p.* 7, *l.* 18 : *Si major supponatur, tunc deleantur tot unitates quot contineat inferior figura et residuum loco ejus ponatur.* 178. *Ms.* meire. 186-7. *cf. SB., p.* 7, *l.* 27 : *ea deleta loco ejus scribatur cifra ne figuræ sequentes minus significent.* 191-3. *cf. SB., p.* 8, *l.* 1 : *et in redeundo in loco cujuslibet cifræ pertransitæ ponatur figura nonenarii.* 192. *Ms.* De ch. c. fay.

Enssi toutes les osterais,
Tant que toutes osteis avrais.
Et quant tu avrais tout subtrait,
Si rajoust; se t'as bien fait,
S'avras les figures devant;
Ne mentirais ne tant ne quant,
Car se as aleit droite voie,
T'aras che que devant avoie.
[IV] Duplication est quant ons puet
Doubleir .i. nombre. *Et* si estuet
Qui est a seniestre comment.
Unc nombre y convient seulement.
Et le promier doit dobleras,
Et li nombre que t'en feras
Ert compos, article ou dois. fo. 211b
Se ch'est dois, promier faire dois
En lieu de cel doit qu'i astoit
Unc doit, qui les dois valeur doit.
Se ch'est artycle, se dois faire
Promier cyfre, *et* le doit defaire,
Et aprés dois metre a senieste
Le doit dont li artycles neste.
Se li nombre com tu doblas
Soit compos, tu promiers feras
Le doit qui oultre l'article est,
Et le doit del article mes
A seniestre ensi com devant.
Ensi vas tout adés faisant,
Tant que trestot dobleit avrais.
Et si diray que tu ferais
Se cyfre y est : si n'en fais riens,
Car cyfre ne fait ne .i. ne riens;
De ly nulle riens ne ferais,
Mains toute quoy le lairais.
[V] Dimidiation si est
Quant d'on nombre li moitie est
Ostee. Si doit ons a diestre
Commenchier, non pais a seneistre;
Et une toute de figures

Thus you must take them all away, until every one is subtracted. And when you have subtracted the whole, add up again; if you have worked the sum properly, you will get back the original figures; you will not tell the least untruth, for if you have gone straight, you will get back what you had at first.

IV. Duplication is when one can double a number. It is necessary that what is on the left should begin. Only one number is required for it. You must double the first digit, and the number which you make from it will be a composite, an article, or a digit. If it is a digit, you should first write in place of that digit which was there a digit which is equivalent to the two. If it is an article, first a cypher must be written, and the digit cancelled, and then you must put on the left the digit which forms the article. If the number resulting from your doubling is a composite, you must first write down the digit which exceeds the article, and put the digit of the article on the left as before. Go on doubling everything thus, until you have doubled the whole. And I will tell you what to do, if there is a cypher in the number : do nothing with it at all, for a cypher does not represent one or anything at all; you must do nothing with it, but leave it entirely undisturbed.

V. Dimidiation is when the half is deducted from a number. One should begin on the right, not on the left; and a single set

202-3. *corr.* droites voies *and* avoies (*cf.* 266-7)? 234-5. *cf. SB., p.* 9, *l.* 3 : *In mediatione autem tantum est unus ordo figurarum et unus numerus necessarius, scilicet, numerus mediandus.*

Y covie*nt* se*ns* plus p*ar* droitures.
Celle qui tout promier serait
Ou .i. ou dois aultre ferait.
Se ch'est .i., si le dois defaire,
Et en son lieu cyfre refaire,
Et deseur signe de demi,
Ou .i. 'de', si le fiers parmi.
Se aultre dois que .i. estoit,
Ou peire ou nonpeire esseroit.
Le motie osteis, s'ilh est peire;
Et s'ilh n'est peire mai*ns* no*n*peire,
Si oste le moitie de peire
Qui plus pres est sous le no*n*peire.
Par l'uniteit qui deseur vient
Signe de demi faire *con*vie*n*t.
Qua*n*t la p*ro*mier fait avras,
A la seconde t'en yras,
Si le veras peire ou no*n*peire.
S'ilh est peire, s'en dois osteire
La motie; et s'ilh avient
Que no*n*peire soit, do*n*t se *con*vie*n*t
Osteir la moitie de peire
Qui plus pres est sous le no*n*peire.
Ly uniteit qui remanra
Ou regart deva*n*t .x. vaura;
Des .x. les .v. osteir en dois,
Et les altres .v. faire dois fo. 211c
Aveque le doit q*ui* est devant.
Ensi vas tout adés faisant.
Et qua*n*t ensi tout avrais fait,
Si le redouble tout afait,
S'avrais che que deva*n*t avoies,
Se tu as aleit droit voies.

of figures is all that is needed for it. The figure which comes first will be either one or some other digit. If it is a one, you should cancel it, and write in its place a cypher, with a 'half' sign above it, or a 'de' with a stroke through it. If it was any digit other than one, it would be either even or odd. Take away the half, if it is even; and if it is not even, but odd, take away the half of the even number which is nearest below the odd number. In respect of the unit which is left over, a 'half' sign must be written. When you have dealt with the first figure, you must go on to the second, and you will see it to be even or odd. If it is even, you should take away the half from it; and if it happens to be odd, then you must take away the half of the even number which is nearest below the odd number. The unit which is left will be worth ten in the preceding position; from the ten you should take away five, and you should add on the other five to the preceding digit. Continue to follow this method all the time. And when you have worked the whole of it in this manner, double the entire numbeu obtained, and you will get back what you had originally, if yor have gone straight.

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238. i] *Ms.* iii. 243. *Ms.* efferoit. 245-7. *cf. SB., p.* 9, *l.* 25 : ***Si impar, sume numerum proximum parem sub illo contentum, et medietatem ejus pone in loco illius imparis deleti.*** 247. pres] *Ms.* peire (*cf.* 257); sous] *Ms.* sens. 249. *Ms.* Signour. 251. *Ms.* yuras. 252. *Ms.* feıas. 257. sous] *Ms.* sor. 258-9. *cf. SB., p.* 10, *l.* 17 : ***unitas autem quæ remanet medianda valet decem respectu figuræ præcedentis.*** 259. *Ms.* venra. 261-2. *cf. SB., p.* 10, *l.* 20 : ***et reliquus addatur figuræ præcedenti.***

[VI] Multiplication si est
Quant .i. nombre multiplyét est
Tant que quantes [fois] puit valoir
Uns des dois nombres qu'en .i. avoir
Com l'autre avoit de uniteis.
Dois nombres par forche y meteis,
L'un deseure, par teile maniere :
La deraine sous la promiere.
S'estuet commenchier a seniestre.
La deraine desous doit estre
Menee a cheli qui estoit
Sor la promier, et se li doit
Metre sour cheli tant de fois
Dont .i. avoit, tout sens defois.
Aprés la seconde manrais
A cheli meisme, si ferais
Sour la seconde celle deson
Tant fois com seconde at de .i.
Ensi celle desous menrais
A cel deseur. Et pius metrais
Desous cheli qui aprés est
Celle desous; et si le mes
L'une aprés l'autre tout a fait,
Et ensi com devant refait.
Toutes celles desous menrais
En la figure que mise as
Sor le deraine de desos.
Quant tes nombre serait fais tos,
Si avras che que tu querois,
Se tu as aleit chemien drois.
Se cyfre est desos, si le mes
Deseur li; ses lieu vuis est.
S'elle [est] desus, si le trespasse,
Et le figure aprés repasse,
Et tes figure avanchier dois.
Tout enssi adés faire dois.
Qui bien multiplyer vora,
.vi. regles savoir convenra.
La promier regle estre doit

VI. Multiplication is when a number is multiplied so that one of the two numbers may be worth as many times what the other contained (?) as the second contained units. Of necessity you must put down two numbers, one above the other, in this manner : the last [right-hand figure] beneath the first [left-hand figure]. One must begin on the left. The last figure underneath should be multiplied into that figure which was (*or* stands ?) over the first, and you should place that figure over it [the under figure] as many times as it [the under figure] contained units, without any hindrance. Next you must multiply the second figure into that same [upper] figure, and you must write the upper figure over the second as many times as the second contains units. Thus you must multiply the under figure into the upper number. And then you must put the under figure beneath the figure which comes next; and put them all similarly one after the other, and do again the same as before. You must multiply all those beneath into the figure which you have placed over the last of the under number. When your number is completed, you will have what you were seeking, if you have gone straight. If there is a cypher in the under number, put it [the cypher] above it [the multiplier]; its place is void. If there is one in the upper number, pass it by, pass the following figure also, and you should move your figures forward. You should continue the operation in this manner.

If one wishes to multiply accurately, one must know six rules.

268-72. *cf. SB., p.* 12, *l.* 6 : *Multiplicatio... propositis duobus numeris, est tertii inventio qui contineat alterum illorum quot continentur unitates in reliquo.* 271. *Ms.* nombreis. 272. *Ms.* Com est lautre. 274-5. *cf. SB., p.* 13, *l.* 27 : *ita tamen quod prima figura inferioris ordinis sit sub ultima superioris. After* 274 *a verse beginning* Lautre derain (*rest illegible*) *has been struck out with red ink.* 277-9. *cf. SB., p.* 13, *l.* 29 : *Hoc facto, ducenda est ultima multiplicantis in ultimam multiplicandi.* 283. si] *Ms.* trois. 292. *Ms.* metrais. 300-2. *cf. SB., p.* 15, *l.* 16 : *Si autem contingat quod cifra sit inter primam figuram et ultimam multiplicandi, anteriorandus est ordo figurarum per duas differentias.* 300. S'elle] *Ms.* Celle.

Quant doit multiplye le doit;
Ou doit l'article multiplye,
Ou dois le conpos multiplie,
Article multiplie article
Ou *com*pos, conpos le ticle.
Se li dois multiplye dois,
Donc p*ro*merain regarde[ir] dois fo. 211d
Co*m*bien li plus grans dois
Menre de .x. est; puis si dois
Le meneur tant fois osteir
Del article menre, et gardeir
Co*m*bien ilh poroit remanoir,
Car li no*m*bre vuet tant valoir.
Se li dois multiplie article,
Si pre*n*dre le dois del article
Et le doit qu'avoies devant,
Pius vas entre eaux multipli*an*t;
Et ta*n*t donke co*m* tu en avrais,
Tant de .x. tes no*m*bre ferais.
Se co*m*pos multiplye dois,
Tu del article pre*n*dre dois
Aveque le doit co*m* tu avois,
Et se le maine droit voies;
Et tant .i. q*ue* tu avrais d'eaux,
Tant de .x. si fero*n*t entre eaux.
Li doit qu'oultre l'article astoit
Multiplie a promerain doit,
Et tant co*m* de .i. y avrais,
Tant donk aveq*ue* les .x. ferais.
S'article multiplie article,
Si pre*n*drais les dois des articles,
Entre eaux les multiplirais;
Et tant .i. co*m* tu en avrais,
Tant de cens tos tes no*m*bres fait.
Nulle rie*n*s plus ne mai*n*s n'y fait.
S'article multeplie *com*post,
Les dois des articles pre*n*s tost,
Et tant .i. co*m* d'andois venra,
Tant de cens tes no*m*bres fera.

The first rule applies when a digit multiplies a digit; or a digit multiplies an article, or a digit multiplies a composite, an article multiplies an article or a composite, a composite [multiplies] another composite. If a digit multiplies a digit, then you should first consider by how much the greater digit is less than ten; then you should take away the lesser digit that number of times from the lesser article [*i.e.* the article formed by the lesser digit], and see how much there may remain, for the required number will be that amount. If a digit multiplies an article, take the digit of the article and the digit which you had at first, then multiply them together; and whatever the amount produced by this multiplication, your total will be ten times as much. If a digit multiplies a composite, you should take [the digit] of the article and the digit that you have already, and multiply them in the correct manner (?); and whatever number of units you obtain from them, they will make ten times as many between them. Multiply the digit following the article into the first digit, and whatever number of units you obtain, you must then add it on to the tens. If an article multiplies an article, you must take the digits of the articles and multiply them together; and whatever number of units you obtain from them, your total number is one hundred times as much. Do nothing more or less in this operation. If an article multiplies a composite, take quickly the digits of the articles, and whatever number of units results from these two, your total will amount to one hundred times as much. Then take the digit following

307. Quant] *Ms.* Qui; *Ms.* multiplyer. 308. *Ms.* multiplyer. 315. *Ms.* Mere. 317. menre] *Ms.* metre (*cf.* 292). 321. *corr.* Si prens *or* Prendre dois ? 326-35. *cf. SB., p.* 13, *l.* 3 : *Quando autem digitus multiplicat numerum compositum, ducendus est digitus in utramque partem numeri compositi, ita quoddigitus in digitum per primam regulam, et digitus in articulum per secundam regulam; postea producta conjungantur simul et erit summa totius multiplicationis.* 326. *Ms.* multiplyer. 327. Tu] *corr.* Cel ? 329. le] *corr.* les ?; voies] *Ms.* viues (*cf.* 267). 332. *Ms.* qui autre article (*cf.* 148, 346).

Pius [prens] le doit d'oultre l'article
Et le doit del promier article,
Entre eaux les multiplierais;
Et tant .i. que tu en avrais,
Tant de .x. ton nombre ferait,
Aveque les cens que devant ait.
Se compos conpost multiplie,
Prens le doit de cascunne article,
Entre eaux les multiplierais;
Et tant .i. com tu en avrais,
Tant de cens avrais. Pius prens toist
Le doit dont li .i. est conpoist,
Avoit le doit de l'autre article
Multiplie ensemble le ticle;
De l'autre article prens le doit
Et de l'autre compos le doit,
Entre eaux les multiplierais;
Quans .i. y at, tant .x. avrais.
Pius prens des dois compos les dois,
Entre eaux multiplyer les dois; fo. 212a
Et tant .i. com [des] dois avrais,
Tant aveque ton nombre avrais.
Qui chi unc pou penseir vora,
Tantoist multiplyer sara.

[VII] Division est quant ons puet
Avoir dois nombres, *et* s'estuet
Unc nombre de ches dois troveir
Que ons tant de fois puist osteir
De plus grant nombre c'on avoit
Com ou menre de .i. avroit.
A mains de dois nombre ons ne puet.
Le meneur desous faire estuet.
Si dois commenchier a seniestre,
Et la deraine figure estre...
Cascunne ensi mise estre doit.
En dois cas no regle faroit :
Quant [c]elle deseure serait
Menre que celle desous n'est,
Ou quant celle qui aprés est

the article and the digit of the first article, and multiply them together; and whatever number of units you obtain from this multiplication, your total will amount to ten times as much, to be added to the hundreds already there. If a composite multiplies a composite, take the digits of each article and multiply them together; and whatever number of units you obtain from them, your total will be so many hundreds. Then take quickly the digit which forms part of one composite, multiply this figure with the digit of the other article; take the digit of the other article and the digit of the other composite, and multiply them together; whatever number of units results, your total will be so many tens. Then take the digits of the two composites, and you should multiply them together; and whatever number of units you obtain from the two, that number you must add to your total. He who will ponder a little upon these instructions will forthwith know how to multiply.

VII. Division is when one can have two numbers, and it is necessary to find from these two a number which can be taken away from one's greater number as many times as there are units in the lesser. With less than two numbers the operation is impossible. The lesser number must be written underneath. You should begin on the left, and the last figure [should] be..... Each figure should be placed thus. In two cases our rule [of putting the last figure of the divisor beneath the last of the dividend]

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350. .x.] *Ms.* cens; ton] *Ms.* con. 353. de] *Ms.* da. 358. Avoit] *corr.* Avuec? 360. *Ms. et* prens. 367. avrais] *corr.* ferais (*cf.* 335)? 370-5. *cf. SB., p.* 16, *l.* 1 : *Divisio numeri per numerum est, propositis duobus numeris, majorem in tot partes distribuere quot sunt unitates in minori.* 375. ou menre] *Ms.* .i. mere (*cf.* 315). 381. *corr.* farait ?

Tant de fois ne puet estre ostee
Com celle devant est rostee.
Adonc toy dis que tu ferais :
Sous celle aprés le meterais.
Aprés si dois tu regardeir
Quant fois ons porait osteir
Cheli desous de cel desu.
Mains en teile maniere dois tu
Chel osteir qui promeraine est,
Que cel oussi qui aprés est
Puist ostee estre tant de fois
Com cel devoit. Et puis dois,
Sens la deraine a main diestre,
Quantes fois les ostas, dols mestre,
Aprés chu figureir de mes
Sor la figure qui aprés est.
Pius dois osteir cel[es] desous
De celes deseur tous
Tant de fois com tu porais;
L'une tant com l'autre osterais.
En hault tant .i. faire t'estuet
Quantes fois osteir ons le puet.
Quante toutes osteir tu ne poras,
Tu en hault .i. cyfre feras;
Aprés teis figure ramenche,
Et com devant faire commenche,
Tant que li figure promiere
Soit tout droit desous la promiere.
Nulle figure n'en osterais
Plus de .ix. fois ; mains osterais
Ches figures l'une aprés l'autre,
Et autretant l'une com l'autre. fo. 212b
Et quant ostee les avrais
Tant de fois com tu saverais,
S'acunne chouse remeise est
De nombre, si fais menres est;
Car s'ilh eust ensi grans esteit,
Tos li nombre seroit osteit.
Mains que remeis en serait

would fail : when the upper figure is less than that beneath, or when that figure which follows cannot be taken away as many times as the preceding figure has been. I tell you what to do in such cases : you must put it [the last figure of the divisor] under the figure which follows. Next you should consider how many times one can take away the under from the upper figure. But you should take away the figure which is first in such a manner that the figure which follows can also be taken away as many times as the former was to be. Then, omitting the last figure on the right, you should next indicate, in addition (?), dear sir, above the figure which follows, how many times you took them away. Then you should take away all the under figures from those above as many times as you can; you must take then away, one and all. Above you must write as many units as the number of times one can take them away. When you cannot take them all away, you must write a cypher above; then move forward (?) your figures, and begin to do as before, until the first figure [of the divisor] is directly beneath the first [of the dividend]. You must not take away any figure more than nine times; but you must take away these figures one after another, and the one figure just as much as the other [*i.e.* not only the first figure of the divisor, but also the figures following it]. And when you have taken them away as many times as you can, if anything of the number is left over, it is made less [than the divisor]; for if it had been as large [as the divisor], the whole number would have been taken away.

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385. *Ms.* defois. 388. Sous] *Ms.* Sor. 394. oussi] *Ms.* ensi. 395. estre] *Ms.* estue. 396-400. *cf. SB., p.* 17, *l.* 7 : *scribendus est numerus denotans quotiens ex directo supraposito illius figuræ sub qua est prima figura numeri divisoris.* 402. De] *Ms.* Et. 409. *cf. SB., p.* 17, *l.* 16 : *et anteriorandæ sunt figuræ.* 412. *written after* 413, *an angulated line indicates its proper place.* 422. seroit] *Ms.* erent.

Mult bien gardeir le *con*ve*n*rait.
Le menour m*u*ltiplierais
Aveque cheli que troveit ais;
Pius adjoste le remanant,
Si avrais chu qu'avoies deva*n*t.
Et s'ilh avie*n*t q*u*'ilh toy rema*n*gne
Des cyfre, fais en ton ovra*n*gne
Ensi bien co*m* se fuisse*n*t dois,
Car tout ensi faire le dois.
[VIII] Progression est qua*n*t ons *com*pte
No*m*bre tout affait en .i. monte
Co*m*bien la so*m*me toute fait,
Et qua*n*t en peire ou no*n*peire lait;
Ou ons pre*n*t trestos les no*n*peire,
Ou ons lait trestos les nonpeire.
En .ix. manieres en y at,
Que par regle savoir porat.
Ou ch'est no*m*bre trestot affait,
Ou entre dois, ou ons en lait.
Se li no*m*bre tout a fait est,
Li fins est peire, ou no*n*peire est.
S'en peire finist, la motie pre*n*t,
Et li no*m*bre aprés le fin prent,
Si les m*u*ltiplye, si avrais
Tres bien chu que dema*n*derais.
Et s'ilh diffinist en nonpeire,
La plus gra*n*t part pre*n*s de no*n*peire
Qui est plus pres de la moitie,
Et aprés si le multiplie
A la fin que devant avois,
Si avrais chu q*ue* tu q*ue*rois.
Se tu vues savoir tos les peires,
Si pre*n*s la motie des peires
Et le nombre aprés la motie,
Et tantoist si les m*u*ltiplie,
Si avrais che que demandas,
Se bien multiplyét les as.
Se tu vues savoir des no*n*peire,
Si pre*n*s le fin de tes nonpeire,

But what is left of the number must be carefully preserved. You must multiply the smaller number with that which you have obtained; then add on the remainder, and you will get back what you had originally. And if it befalls that any cyphers are left over, act in your calculation just as though they were digits, for that is how you should proceed.

VIII. Progression is when one reckons up into a single total a series of numbers, to find out the sum of them all, or the sum when one leaves out even or odd numbers; one may either take all the odd numbers, or one may leave out all the odd numbers. There are nine (?) manners of doing this operation, which you can learn by rule. It is either an entire series of numbers, or a series between two numbers, or a series in which some numbers are omitted. If the series of numbers is entire, the final number is either even or odd. If the series ends in an even number, take half of it, and take the number which follows the final number, multiply them together, and you will obtain exactly what you want. If it ends in an odd number, take the larger part, nearest to one-half, of the odd number, and then multiply it with the final number that you had before, and you will obtain what you were seeking. If you wish to know [the sum of] all the even numbers, take the half of the even numbers and the number following the half, and forthwith multiply them, and you will obtain what you wanted, if you have multiplied them correctly. If you wish

433. Progressio *in right margin.* 433ff. *cf. SB., p.* 18. 436. en] *corr.* ons ? 445. S'en peire] *Ms.*Sens plus. 447. *Ms.* Sens multiplyer. 458. *Ms.* Est t. et les m.

Et si le pars en dois moities;
Et pre*n*s la plus gra*n*t parties,
Se le multeplie par li,
Si avras chu q*ue* tu as qui.
Deseur mais en pais vou laray,
D'algorisme plus ne diray.
Mains le bien s'entendut aveis, fo. 212c
Tout che qu'oyt dire m'aveis,
N'est rie*n*s de no*m*bre c'o*n* puist dire
Q*ue* vos ne seussies ta*n*toist dire.
De studoier estre songneux
Doit estre li hons q*ui* *con*voiteux
Est d'apre*n*dre; car li estude
Fait plus savoir c'o*n* ne cuide,
Et retenir c'o*n* ne pense.
L'estude est une despense
Et unc tressorie q*ui* tot plain
Est de joweais de trestos clain,
Et pre*n*dre n'e*n* y seit ons tant
Que ons le voise amenrissa*n*t.
Car qua*n*t .i. clerc at estudiet,
Et la scie*n*che qui li siet,
Tant q*u*'ilh en at plaine sa tieste,
A la scie*n*che n'at fait molieste;
N'a l'estude de riens vuidiet
De chu q*u*'ilh en at conchiet;
Or ta*n*t en demeurt en l'estude
Co*m* deva*n*t, si co*m* je cuide.
Si p*r*ions Dieu par sa piteit
D'estudoier la volenteit
Nos do*n*ne, et si bone scie*n*che
Que nos menons en *con*scie*n*che
Toudis de faire le sien plaisiere :
Amen, si co*m* je le desire.

to know [the sum] of the odd numbers, take the last of your odd numbers and divide it into two halves; take then the larger part and multiply it by itself, and you will have what you sought after.

Henceforth I will leave you in peace, and say no more of algorism. But if you have understood all the good that you have heard me say, there is no arithmetical problem that can be mentioned which you could not at once answer. The man who is eager to learn should be careful to study; for study causes one to know more than one thinks, and to retain [in one's mind] more than one realizes. Study is a store and a treasury which is quite filled with jewels of all kinds, and one can never take so much from it as to cause it to dwindle. For when a clerk has studied in the learning which suits him, to such an extent that his head is full of it, he has done no hurt to the learning; he has in no degree exhausted study because of the amount of it that he has mastered; now let him persist in his study to the same extent as before, so it seems to me. Let us then pray God by his pity to grant us the will to study, and learning so good that we may always lead our lives with the intention of doing his pleasure. Amen, such is my desire.

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463. le] *Ms.* les. 464. *corr.* [des] parties ? 479. *Ms.* tressorier. 482. *Ms.* amairissant. 484. Et] *corr.* En ?

WORD-LIST.

[Technical terms, other words of lexical interest, and a few forms not explained in the Introduction are included. Square brackets indicate that an emendation has been introduced. An asterisk indicates that the meaning adopted is not mentioned in the dictionaries of TOBLER-LOMMATZSCH (down to *cl-*) or GODEFROY (from *co-*).]

abaque, *s.* 10.
aconstumer, *v. a. bring into use* 45.
addition, *sf.* 107, 118.
adés, *adv. at once* 81; *still* 89; *all the time, continuously* 223, 263, 303.
adjousteir 118, 129, -osteir 152 ff., 427, *v. a.*
afait, aff- *see* tout.
afature, *sf. preparation*, (*hence*) *equipment* 38; *cf.* afaitier, *to make ready*.
algorisme, *s.* [1], 24, 468.
[amenrir], *v. a. diminish* 482.
*andois, *both* 344.
apairier, *v. a. make a pair, unite* 135.
arismetique, *s.* 7.
article, *sm. number completely divisible by ten* 92, 96, etc.

*bon, *adj. of good omen, right* (*hand*) 51.
*clain, *sm. designation*, (*hence*) *class, kind* 480; *cf.* clamer, *to designate*.
comment, *subj. pr.* 3 *sg. of* commenchier, *v. n.* 206.
*compos 92, etc., con- 311, etc., compost 342, con- 352, conpoist 357, *adj. composite* 98; *sm. number of more than one figure, not completely divisible by ten.*
compte, *sm. calculation* Prol., 3, 33, 144; *set of figures, number* 16.
conchier, *v. a.* (*used figuratively*) 488.
*conscienche, *sf. mind* 20, 494.
cyfre 14, 62, 140, etc., chiffre 38, *sf. cypher, nought.*

debautre, v. *dispute*, 15.
defaire, *v. a. suppress, cancel* 133, 142, 174, [192], 215, 238.
defois, *sm. prohibition* 281.
deseur, *adv. henceforth* 467.
*deson, *adv. above* 284; *not in Godefroy.*
despense, *sf. provision, store* 478.
desquent, *?* 9.
devantrain, *adj.* 49.
devise, *sf. ?* 66.
deviseir, *v. divide* 17, 99.
diffinir, *v. n. end* 449.
*dimidiation, *sf.* [110], 230.

•dire, *v. a. tell* (*a number*), *place in its order* 125.
division, *sf.* 112, 370.
dobleir, dou-, *v. a.* 205, 208, 218.
•dois, doit, *sm. digit* 91, 141, etc.
droite voie 202, droit voies 267, [329], *adv. straight* (*used figuratively*).
•duplication, *sf.* 109, 204.

ensyet Prol., ensiete 109, *ind. pr.* 3 *sg. of* ensiere (*Fr.* ensiwre, ensuivre), *v. refl.*
•espise, *s. subdivision, operation* (*Lat.* species) 104.
•estudoier 492, stu- 473, *v. n.*; *no example having this suffix is given by Godefroy.*

•faire (aveque), *v. a. add* 261, 335, *cf.* 367.
faroit, *cond.* 3 *sg. of* faure (*Fr.* faillir) 381.
figure, *sf.* 14, 37, 48, etc.
figureir, *v. a. indicate, write down* 399.

hoir = hors *adv.* 159.

jointe, *sf. augmentation* 189.
jointure, *sf. union, combination* 13.
joweais = *Fr.* joiaus, joyaux, *s.* 480.
•leveir, *v. a. accomplish, effect* (*?*) 33.

maine, *ind. pr.* 3 *sg. of* meneir, *v. a.* 329.
manrais, *fut.* 2 *sg. of* meneir, *v. a.* 282.
mathematique, *adj.* 8.
•meneir, *v. a. multiply* 278, 282, 286, [292], 329; *v. refl. conduct oneself* 494.
mes, *adv.*; •de m., *in addition, also* (*?*) 399; *cf.* de plus, de mieuz, de pis (TOBLER, *Vermischte Beiträge, II, 2nd edition, pp.* 62 *f.*).
•metre, *v. a. employ* (*?*) 2.
molieste, *s.*; faire m. a, *trouble, harm* 486.
monte, *sm. heap*, (*here*) *total* 434.
multiplication, *sf.* 111, 268.
multiplyer 15, 269, etc., -plier 309, etc., -teplier 342, *v.*

nest 179, neste 217, *ind. pr.* 3 *sg. of* naistre.
•nombre, *sm. system of numbering or reckoning* 1, 2, 7, 104.
nonpeire, *adj. odd* (*number*) 243, etc.
numeration, *sf.* 106, 114.

ouwetemme, *eighth* 113.
ovrangne, *s. task* 430.

•parfait, *adj.*; nombre p. 161.

peire, *adj. even* (*number*) 243, etc.
•progression, *sf.* 113, 433.
promerain, *adv.* 313.
promier, *adv.* 147; a p. 65, 72, 85; al p. 137.
puit, *subj. pr.* 3 *sg. of* pooir 270.

•racompteir, *v. count again* 79; *cf.* reconter, recompter *in Godefroy.*
rajousteir, *v. add again* 199.
ramanant 183, rem- 427, *sm.*
ramenche, *imperat.* 2 *sg. of* rameneir 409.
reclout, *ind. pr.* 3 *sg. of* reclore 20.
redoubleir, *v.a.* 265.
•regart, *sm. position* 259; *cf.* ou r. desous *in the algorism published by* C. MORTET (*Bibl. Mathematica, ser.* 3, *vol. IX*, 1908), *p.* 62, *l.* 3.
repoiseir, *v. a. place* 163.
[risme], *s.* 25.
rostee = re, *in one's turn*, + ostee 386.

scienche, *sf.* 8, 19, 484, etc.
subtilh Prol., *nom.* -is 5, *adj. subtle, precise, accurate.*
subtiliteit, *s. accuracy* 22.
subtraction, *sf.* 108, 156.
subtraire, *v. a.* 198.

•ticle, *sm. ?* 311, 359; *appears to be an expression substituted, to avoid repetition, for a word just used* (conpos 311, doit 359).
tout a fait 290, 443, t. afait 265, t. affait 434, trestot affait 441, *all, the whole*; *cf. Godefroy* III, 708*a* a fait.
•toute, *sf. set* (*of figures*)*?* 234; *perhaps corrupt.*
traitier, *sm. treatise* 28.
[tressorie], *sm. treasury* 479.

unité 180, -teit 248, 258, 272, *s. unit.*

•vaqueir, *v. n.* 9; = *Lat.* vacare *?*
viereis, *fut.* 2 *pl. of* veoir, *v.* 35.
voise, *subj. pr.* 3 *sg. of* aler, *v. n.* 482.
vora, *fut.* 3 *sg. of* voloir, *v. n.* 304, 368.
vuidier, *v. a. exhaust* 487.

(*Oxford.*) E. G. R. WATERS.

Une lettre inédite de Newton*

« this shining spirit, who pointed out, as none before or after him did ».
(A. EINSTEIN)

La lettre de NEWTON qu'avec la bienveillante autorisation de Mr. le Conservateur des Manuscrits du British Museum nous avons l'honneur de présenter au public est inédite. Elle fut acquise le 29 juin 1904 à une vente chez Messrs. SOTHEBY & C° et fait partie d'une collection d'autographes divers catalogués sous le N° 37.021 (f. 56). Son intérêt réside surtout dans la manière tout à fait moderne — moins sans doute en ce qui concerne la forme que l'esprit — dont y est traité un problème d'une extrême difficulté. En outre, sa publication comble une importante lacune de la correspondance entre NEWTON et HOOKE (1) reproduite par W. W. ROUSE BALL dans son ouvrage *An Essay on Newton's Principia* (2) auquel le lecteur pourra très utilement se référer (3).

On sait, de l'aveu même de NEWTON, l'importance qu'eut pour lui cet échange de lettres (4) : ce fut réellement le point de départ de nouvelles recherches particulièrement conséquentes en raison de l'application à la mécanique céleste des résultats obtenus. Afin de permettre une lecture aisée du document que nous avons

(*) Cet article était déjà écrit lorsque, au cours d'un nouveau séjour en Angleterre, nous avons retrouvé le journal inédit de HOOKE. Nous sommes heureux de pouvoir dès à présent publier ici les passages de ce *diary* relatifs aux lettres de NEWTON.

(1) NEWTON et HOOKE écrivent indifféremment HOOK et HOOKE.

(2) London, MACMILLAN & C°., 1893 : cf. spécialement pp. 19 et 146.

(3) Cette lettre éclaire également d'un jour nouveau la correspondance avec HALLEY (mai 1686-juillet 1687) : ROUSE BALL, *loc. cit.* pp. 153-174; *cf.* aussi la lettre de AUBREY et HOOKE à A. WOOD (15 sept. 1689) : S. P. RIGAUD, *Historical Essay on the first publication of Sir Isaac Newton's Principia*, Oxford, 1838, app. p. 52.

(4) « This is true, that his letters occasioned my finding the method of determining figures, which when I had tried in the ellipsis, I threw the calculations by, being upon other studies » (lettre à HALLEY, 14 Juillet 1686).

eu la bonne fortune de retrouver, nous allons indiquer sommairement les circonstances dans lesquelles il fut écrit.

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Celle des correspondances successives et intermittentes entre NEWTON et HOOKE qui nous intéresse, semble comprendre sept lettres, trois de NEWTON et quatre de HOOKE, dont l'une manque seule à présent. (5)

De 1671 à 1676, rien ne révèle l'activité de NEWTON dans le domaine des mathématiques; l'année 1677 marque le point culminant de sa querelle avec HOOKE, provoquée à la fois par des questions de priorité et des divergences dans l'interprétation par la théorie de l'éther des expériences d'optique entreprises par les deux savants; ceux-ci sortaient considérablement aigris de cette polémique stérile qui n'était d'ailleurs pas la première (6). De plus, le caractère pratique des inventions et des recherches de HOOKE, que dévorait un vif désir de gloire, donnait à ses travaux purement scientifiques un aspect d'improvisation et d'inachèvement et dégageait une impression de romantisme qui ne pouvait que déplaire à NEWTON, savant essentiellement classique dans l'acception d'OSTWALD (7). Voici comment plus tard, dans une lettre à HALLEY (20 juin 1686) NEWTON s'exprimera

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(5) Toutefois, d'après le journal de HOOKE (10 mars 167$\frac{1}{2}$-15 mai 1683) que nous venons de découvrir à la Library of the Corporation of the City of London, deux autres lettres — peut-être de simples billets — auraient été échangées. Ce journal nous fournit également les dates des expériences tentées par HOOKE.

Décembre 1679

Fryd. 5 ... D. H. wrote to Mr. NEWTON.

... Sund. 7. wrote Journall. D. H. NEWTON's Letter. Jonathan.

... W. 24 ... Read NEWTON's Letters to BOYLE at Garways.

Janvier 1680

... Fry. 16 ... tryd fall of Bullet in y^{e} hall (wth success) (*cf.* la lettre de HOOKE à NEWTON, 17 janvier, ROUSE BALL, *loc. cit.*, p. 149)

... M. 26 ... tryd perpend. expt.

(6) Cf. *Memoirs of the life, writings, and discoveries of* SIR ISAAC NEWTON, *by* SIR DAVID BREWSTER, Edinburgh, CONSTABLE & C^{o}, 1855 : vol. I, p. 78, et la lettre de NEWTON à HALLEY, 20 juin 1686 : « ... this is the third time that he has given me trouble in this kind ». NEWTON parle ici de la querelle qui va résulter, comme on le verra plus loin, de sa correspondance avec HOOKE (1679-80).

(7) Dans une étude sur NEWTON et la pensée anglaise qui paraîtra prochainement, nous avons recherché dans quelle mesure il est possible d'appliquer les théories de l'illustre philosophe allemand aux savants anglais du dix-septième siècle.

sur le compte de HOOKE : « Should a man who thinks himself knowing, and loves to show it in correcting and instructing others, come to you, when you are busy, and notwithstanding your excuse press discourses upon you, and through his own mistakes correct you, and multiply discourses; and then make this use of it, to boast that he taught you all he spake, and oblige you to acknowledge it, and cry out injury and injustice if you do not; I believe you would think him a man of strange unsociable temper. » (8)

NEWTON ne s'absentait guère de Cambridge, où il vivait dans une quasi solitude. C'est à cette sédentarité que l'on doit une volumineuse correspondance dont cependant des parties considérables sont perdues.

HOOKE qui succédait à OLDENBURG comme Secrétaire de la Royal Society (25 octobre 1677) adresse le 24 novembre 1679, au nom de celle-ci, une première lettre extrêmement courtoise à NEWTON : « ...I hope therefore that you will please to continue your former favours to the Society by communicating what shall occur to you that is philosophicall... » Puis, après une allusion aux intrigues réelles ou imaginaires qui auraient tendu à le brouiller autrefois avec NEWTON, HOOKE ajoute ceci : « For my part I shall take it as a great favour if you shall please to communicate by letter your objections against any hypothesis or opinion of mine; and particularly if you will let me know your thoughts of that of compounding the celestiall motions of the planetts of a direct motion by the tangent and an attractive motion towards the centrall body... » HOOKE termine en mettant son correspondant au courant des résultats de diverses missions scientifiques et lui signale quelques travaux récemment parus.

La réponse de NEWTON à HOOKE date du 28 novembre 1679.

Journal de HOOKE :

munday, DECEMBER 1 ...Letter from NEWTON & BEALE.

Cette lettre assez longue (manuscrit R-4-48 de la bibliothèque de Trinity College Cambridge) a été publiée pour la première fois par ROUSE BALL (9); il y en a quelques passages toutefois

(8) En dépit du jugement sévère de NEWTON, on ne peut se défendre d'un sentiment de pitié à l'égard de HOOKE qui, en raison de ses difformités physiques notamment, traîna une existence en tous points misérable.

(9) ouvrage cité, pp. 141 et sq.

sur lesquels nous croyons utile d'attirer encore l'attention.

Le ton de cet écrit est d'une courtoisie qui paraît presque excessive. Mais NEWTON attache un trop grand prix à sa tranquillité pour consentir à renouer des relations avec son ancien adversaire (10). Aussi insiste-t-il sur le fait qu'il ne s'occupe plus guère de sciences, et ce délaissement n'est pas feint : « But yet my affection to philosophy being worn out,so that I am almost as little concerned about it as one tradesman uses to be about another man's trade or a country man about learning, I must acknowledge my self avers from spending that time in writing about it which I think I can spend otherwise more to my own content and the good of others : and I hope neither you nor any body els will blame me for this aversness ».

« ...I had for some years last been endeavouring to bend myself from philosophy to other studies in so much that I have long grutched the time spent in that study unless it be perhaps at idle hours sometimes for a diversion »; il ne s'agit peut-être pas seulement ici des travaux de laboratoire et d'exégèse auxquels NEWTON consacrait un temps considérable, mais des travaux juridiques qu'il avait également entrepris. On sait aujourd'hui que peu d'années avant 1679, NEWTON, excédé par des disputes incessantes et effrayé du grand nombre de ses contradicteurs, avait songé à abandonner la science pour solliciter une chaire de droit.

A propos des hypothèses cosmogoniques de MALLEMENT, NEWTON écrit : « The readiest way to convince the world of this truth would be I conceive to set forth first in some two of the planets, suppose Mars and the earth, a specimen thereof *stated and determined in numbers.* » Ces derniers mots expriment de fort heureuse façon l'idée qui est à la base de l'œuvre newtonienne : la traduction dans le langage mathématique des faits d'expériences et le contrôle des hypothèses ainsi réalisé en toute sûreté.

La partie de la lettre qui commence par ces mots : « In requital of this advertisement... » constitue, en dépit de la négligence de

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(10) « In my answer to his first letter I refused his correspondence, told him I had laid philosophy aside, sent him only the experiment of projectiles (rather shortly hinted than carefully described), in compliment to sweeten my answer, expected to hear no further from him ». (Lettre à HALLEY, 20 juin 1686).

l'exposé (11), un magnifique exemple de la conception d'un problème scientifique chez NEWTON ; c'est ce qui en fait au point de vue philosophique l'inestimable valeur ; ce passage établit en outre la priorité de NEWTON dans le calcul de la déviation des graves. Certes, avant lui, « TYCHO-BRAHÉ, dans son *De mundi aetherei recentioribus phaenomenis* (1588-1610) avait indiqué comme objection principale contre la rotation de la terre,qu'une pierre tombant sur le coté ouest d'une tour devait dévier à l'ouest de la verticale, « car pendant sa chute la terre fuit sous elle vers l'est ! » (12) GALILÉE (13) soupçonna une déviation vers l'est et ne semble pas, au surplus, avoir trouvé d'arguments s'opposant à la démonstration de la rotation axiale de la terre. LÉONARD DE VINCI posa nettement le problème quoique probablement convaincu de l'immobilité de la terre. Mais, il faut bien le reconnaître, les méthodes de la science positive font défaut chez ces précurseurs ; les bases théoriques sont vagues, les recherches expérimentales nulles. « In the way of actual justification of our confidence in the existence of an entirely physical causality, virtually nothing had been achieved before NEWTON, who was placed by fate at a turning-point in the world's intellectual development » (14).

NEWTON, qui qualifie modestement son travail de « fansy of my own » explique qu'un corps lâché d'une certaine hauteur « will shoot forward to the east side of the perpendicular describing in its fall a spiral line (15), ADEC (16), quite contrary to the opinion of the

(11) Cette négligence concerne surtout la forme ; au contraire, certains détails de l'expérience proposée par NEWTON révèlent un sens admirable de l'importance relative des causes d'erreurs dont HOOKE allait avoir à tenir compte au cours de l'expérimentation, par exemple la dissymétrie causée dans les couches d'air du puits par la chute de la bille : « for in a narrow well the bullet possibly may be apt to receive a ply from the straitened air neare the sides of the well, if in its fall it come nearer to one side than to another ».

(12) EDM. HOPPE, Hist. de la Physique, 1928 p. 54.

(13) Opere di GALILEO GALILEI, vol. 7, 1897, pp. 170 et 259.

(14) A. EINSTEIN : ISAAC NEWTON, *the Observatory*, May 1927.

(15) J. G. HAGEN (S. J.) dans son ouvrage « *La Rotation de la Terre, ses preuves mécaniques anciennes et nouvelles*, Rome, 1911 » a cru devoir commenter comme suit le texte de NEWTON : « L'idée de dessiner cette spirale peut lui avoir été suggérée par un passage de l'*Epitome Astronomiæ Copernicanæ* de KÉPLER, paru en 1618 (*Opera omnia*, VI, 1, 1865 p. 182) où est représentée une courbe ressemblant à une spirale. Le sens que KÉPLER attachait à cette courbe est assez incertain, mais pourrait peut être s'éclairer par des passages d'auteurs antérieurs à COPERNIC. LÉONARD DE VINCI s'était occupé du problème suivant : « Du grave

vulgar who think that, if the earth moved, heavy bodies in falling would be outrun by its parts and fall on the west side of the perpendicular ». La deuxième partie de cette phrase constitue probablement une allusion à l'opinion de TYCHO, citée plus haut. Notons qu'en 1679 la rotation de la terre était loin d'être admise par tous. Qu'on nous permette en outre de rappeler ici que c'est le 11 septembre 1822 que la Congrégation de l'Inquisition, approuvée par PIE VII, autorisa la publication des livres enseignant le mouvement de la terre.

La lettre de NEWTON fut lue à la Royal Society le 4 décembre; WREN et FLAMSTEAD émirent des observations.

Le passage que nous avons en partie reproduit, relatif à la déviation due au mouvement diurne, ainsi que la figure dessinée par NEWTON lui-même paraissent attester que le futur auteur des Principes croit que le corps va tomber au centre de la terre suivant une trajectoire spirale (17).

La réplique de HOOKE à NEWTON (9 décembre 1679) est perdue; elle fut lue à la Royal Society le 11 décembre.

Journal de HOOKE :

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descendant dans l'air, les éléments étant animés d'un mouvement de circonvolution dont l'entière révolution a lieu en 24 h. » Le texte est accompagné d'une sorte de spirale qui commence « de la partie la plus élevée de la sphère du feu » et se termine à la surface de la terre. Le but de cette figure est de montrer que la « trajectoire du grave », bien que rectiligne, absolument parlant, prend en apparence la forme d'une spirale, par suite de la rotation des sphères célestes. La spirale de LÉONARD est reproduite et expliquée dans un ouvrage récent de P. DUHEM, *Etudes sur Léonard de Vinci, ceux qu'il a lus et ceux qui l'ont lu*, Paris 1908, 2e série, pp. 252-255 ».

(16) Voir la figure, ROUSE BALL, loc. cit., p. 142.

(17) « I thought no further of philosophical matters than his letters put me upon it, and therefore may be allowed not to have had my thoughts of that kind about me so well at that time » (lettre à HALLEY, 20 juin 1686). « I sent him this notion, that a falling body ought by reason of the earth's diurnall motion to advance eastward and not fall to the west as the vulgar opinion is. And in the scheme wherein I explained this I carelessly described the descent of the falling body in a spirall to the center of the earth : which is true in a resisting medium, such as our air is » (lettre à HALLEY, 27 mai 1686). En outre, dans sa lettre suivante au même (20 juin 1686), NEWTON écrit : « I never extended the duplicate proportion lower than to the superficies of the earth, and before a certain demonstration I found the last year, have suspected it did not reach accurately enough down so low... But it sufficiently explains to you, why in considering the descent of a body down to the centre, I used not the duplicate proportion... For his extending the duplicate proportion down to the centre (which I do not) made him correct me ».

Tu. 9... Sent L. to NEWTON BEAL.

HOOKE dans cette lettre montrait que la ligne décrite par le corps dans sa chute « would not be a spiral line, as Mr. NEWTON seemed to suppose, but an excentrical elliptoïd (18), supposing no resistance in the medium : but supposing a resistance, it would be an excentric ellipti-spiral, which, after many revolutions, would rest at last in the centre : that the fall of the heavy body would not be directly east, as Mr. NEWTON supposed; but to the south-east, and more to the south than the east. It was desired, that what was tryable in this experiment might be done with the first opportunity » (19). Avouons qu'en l'absence du texte de HOOKE — que nous avons vainement tenté de retrouver — il est difficile d'imaginer par quel processus l'auteur de la *Micographie* en vint à amender les premiers résultats de NEWTON. « M. HOOKE replyed it would not descend to the center but at a certaine limit returne upwards againe » déclara plus tard NEWTON (20). Nous reprenons plus loin la question de rechercher dans quelle mesure et par quels moyens HOOKE a pu rectifier les erreurs du savant qu'il jalouse.

Voici enfin la réponse irritée et sèche de NEWTON. On la sent pleine d'une impatience difficilement contenue : « I could scarce persuade myself to answer his second letter » (21). Nous avons naturellement respecté l'orthographe et la ponctuation de l'original (22).

S^{r}

I agree wth you y^{t} y^{e} body in o^{r} latitude will fall more to y^{e} south then east if y^{e} height it falls from be any thing great [1]. And also that if its gravity be supposed uniform it will not descend in a spiral to y^{e} very center but circulate wth an alternate ascent & descent made by it's vis centrifuga & gravity alternately overballancing one another. Yet I imagin y^{e} body will not describe

(18) Probablement une courbe ovale : « an ellipsis » dit Newton (lettre à HALLEY, 20 juin 1686.

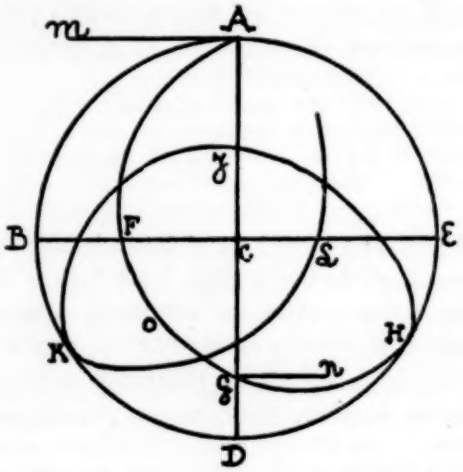
(19) BIRCH, *History of the Royal Society of London*, 1757, vol. 3, p. 516.

(20) Lettre à HALLEY, 27 mai 1686.

(21) Lettre à HALLEY, 20 juin 1686.

(22) Les chiffres entre crochets [ ] dans le texte renvoient aux remarques que nous faisons plus loin.

an Ellipsoeid but rather suit a figure as is represented by A F O G H J K L etc. Suppose A y^e^ body, C y^e^ center of y^e^ earth, A B D E quartered w^th^ perpendicular diameters A D, B E, w^ch^ cut y^e^ said curve in F & G; A M y^e^ tangt in w^ch^ y^e^ body moved before it began to fall & G N a line drawn parallel to y^t^ tangt. When y^e^ body descending through y^e^ earth (supposed pervious) arrives at G, the determination of its motion shall not be towards N but towards y^e^ coast between N & D. ffor y^e^ motion of y^e^ body at G is compounded of y^e^ motion it had at A towards M & of all y^e^ innumerable converging motions successively generated by y^e^ impressesses of gravity in every moment of it's passage from A to G : The motion from A to M being in a parallel to G N inclines not y^e^ body to verge from y^e^ line G N. The innumerable & infinitly little motions (for I here consider motion according to y^e^ method of indivisibles) [2] continually generated by gravity in its passage from A to F incline it to verge from G N towards D, & y^e^ like motions generated in its passage from F to G incline it to verge from G N towards C. But these motions are proportional to y^e^ time they are generated in, & the time of passing from A to F (by reason of y^e^ longer journey & slower motion) is



greater then y^e^ time of passing from F to G. And therefore y^e^ motions generated in AF shall exceed those generated in F G & so make y^e^ body verge from G N to some coast between N & D. The nearest approach therefore of y^e^ body to y^e^ center is not at G but somewhere between G & F as at O. And indeed this

point O, according to y^e various proportions of gravity to the impetus of y^e body at A towards M, may fall any where in y^e angle B C D in a certain curve w^ch touches y^e line B C at C & passes thence to D [3]. Thus I conceive it would be if gravity were y^e same at all distances from y^e center. But if it be supposed greater nearer y^e center [4] y^e point O may fall in y^e line C D or in y^e angle D C E or in other angles y^t follow, or even no where. ffor the increase of gravity in y^e descent may be supposed such y^t y^e body shall by an infinite number of spiral revolutions descend continually till it cross y^e center by motion transcendently swift.

Your acute Letter having put me upon considering thus for y^e species of this curve, I might add something abouts its description by points quam proxime. But the thing being of no great moment [5] I rather be yo^r pardon for having troubled you thus far w^th this second scribble wherin if you meet w^th any thing inept or erroneous I hope you will pardon y^e former & y^e latter I submit & leave to yo^r correction remaining S^r

Yo^r very humble Servant
Is. Newton

Trin Coll.
Dec 13^th 1679 [6]

For Mr. Robert Hooke
at his Lodgings in
Gresham College in London

La lettre porte aussi une inscription due, nous semble-t-il, à la main de Hooke :

Newton De : 13. 1679
to Hook of the line described by falling Bodies, w^th a scheme.

[1] « I learned nothing by his letters but this, that bodies fall not only to the east, but also in our latitude to the south. In the rest his correcting and informing me was to be complain'd of. And tho' his correcting my spiral occasioned my finding the theorem, by which I afterwards examined the ellipsis; yet am I not beholden to him for any light into the business, but only

for the diversion he gave me from my other studies to think on these things, and for his dogmaticalness in writing, as if he had found the motion in the ellipsis, which inclined me to try it, after I saw by what method it was to be done » (lettre à HALLEY, 27 juillet 1686).

Il n'est peut-être pas inutile non plus de reproduire les lignes suivantes, empruntées au traité *de Motu* (troisième exemplaire de la collection Portsmouth, non postérieur probablement au printemps de 1685; ROUSE BALL, loc. cit., pp. 35 et 56) :

« Caeterum projectilium motus in aere nostro referendi sunt ad immensum et revera immobile coelorum spatium, non ad spatium mobile quod una cum terra et aere nostro convolvitur et a rusticis ut immobile spectatur. Invenienda est Ellipsis quam projectile describit in spatio illo vere immobili et inde motus ejus in spatio mobili determinandus. Hoc pacto colligitur grave, quod de aedeficii sublimis vertice demittitur, inter cadendum deflectere aliquantulum a perpendiculo, ut et quanta sit illa deflexio et quam in partem. Et vicissim ex deflexione experimentis comprobata colligitus motus terrae. Cum ipse olim hanc deflexionem Clarissimo HOOKIO significarem, is experimento ter facto rem ita se habere confirmavit, deflectente semper gravi a perpendiculo versus orientem et austrum ut in latitudine nostra boreali oportuit. »

[2] L'allusion à la méthode des indivisibles ainsi que l'emploi de l'expression « the determination of its motion » méritent d'être notés : on imagine assez difficilement en effet que HOOKE n'aie pas été au courant de la méthode des fluxions; il y a peut-être lieu cependant de justifier le texte de NEWTON par les considérations suivantes.

Si l'exposé, dans cette lettre ainsi que dans la précédente (28 novembre), procède de la méthode synthétique, il est toutefois hors de doute que NEWTON obtint ses résultats par la voie analytique, qu'il utilisait dès 1670 avec la notation nouvelle (23). Dans sa deuxième lettre à LEIBNIZ (24 octobre 1676) NEWTON ne donne encore les principes de sa méthode que sous forme de crypto-

(23) L'*Analysis per Æquationes Numero Terminorum Infinitas*, qui fut communiqué à BARROW en 1669, mais n'était pas destiné à la publication, ne contient pas d'indice de la nouvelle notation de NEWTON; la méthode directe des fluxions date de novembre 1665 (cf. Memorandum de la collection Portsmouth et la lettre de NEWTON au Dr. KEILL, 15 mai 1714).

grammes (24). Pourquoi semble-t-il éviter ici l'emploi du mot fluxion, si imagé ? D'où vient cette réserve ? Il y a apparemment deux raisons de cela :

a) l'une est donnée par NEWTON lui-même dans de nombreux écrits. La persistance des attaques dont il était l'objet, la conscience du temps qu'il perdait à réfuter inutilement les opinions souvent peu scientifiques de ses adversaires l'avaient rendu irritable et méfiant. Plus d'une fois, il ne consentit à communiquer ses résultats qu'avec l'assurance que l'anonymat serait respecté. Ses lettres à HALLEY (1686-7) sont remplies de doléances au sujet de la nouvelle querelle provoquée par HOOKE, et les plaintes sont tout aussi vives lors de la première dispute : s'adressant à OLDENBURG : « I intend to be no farther solicitous about matters of philosophy; and therefore I hope you will not take it ill if you never find me doing any thing more in that kind; or rather that you will favour me in my determination, by preventing, so far as you can conveniently, any objections or other philosophical letters that may concern me ». A LEIBNIZ (9 décembre 1675) : « I was so persecuted with discussions arising out of my theory of light, that I blamed my own imprudence for parting with so substantial a blessing as my quiet to run after a shadow » (25).

On comprend donc pourquoi NEWTON eut le plus souvent recours à un exposé synthétique de ses découvertes, exposé qui, — étant donné l'importance prise depuis par la méthode alors toute nouvelle — nous semble archaïque à présent. Nous avons d'ailleurs trouvé récemment à Oxford un brouillon de lettre (non daté, mais postérieur à 1697) que nous espérons pouvoir bientôt publier. NEWTON y fait l'éloge de l'Analyse des Anciens, qu'il trouve plus simple et plus ingénieuse pour un Géomètre que l'Algèbre des modernes. Ce document montre nettement jusqu'à quel point l'auteur des *Principes* s'était assimilé la pensée hellénique. Cependant, en faisant usage pour l'exposé de ses résultats d'une méthode différente de celle utilisée au cours des recherches, il rendit singulièrement ardue la lecture de son œuvre. C'est ainsi

(24) LEIBNIZ possédait certainement à cette époque l'essentiel de sa méthode, mais son premier mémoire concernant la méthode infinitésimale ne parut qu'en 1684, et la période aiguë de la querelle de priorité ne devait commencer que tout à la fin du dix-septième siècle.

(25) cf. aussi les lettres à OLDENBURG des 26 avril et 18 novembre 1676 et l'Introduction du troisième livre des *Principes*.

que LAPLACE ne fut ni le premier ni le dernier à se plaindre de l'obscurité de NEWTON.

b) Il ne faut pas perdre de vue ensuite que NEWTON, en dépit de l'importance et de l'originalité presque uniques de son œuvre mathématique, fut avant tout un physicien, et même un expérimentateur. S'il s'est laissé devancer par LEIBNIZ dans la publication de l'exposé des règles du calcul infinitésimal, c'est parce qu'il ne voulait pas séparer ces règles de leur applications : c'est là l'origine de la stérile querelle de priorité (26). Il eut surtout le désir de faire servir les mathématiques à la résolution de problèmes concrets et ne les cultiva pas pour elles-mêmes (27). Lorsqu'on tente d'envisager dans son ensemble l'œuvre de NEWTON, on a l'impression que l'invention de la méthode des fluxions n'a été qu'une diversion, nécessaire au genre de travaux auxquels le portaient naturellement ses goûts. Au surplus, si l'on totalise le temps qu'il consacra entre les années 1666 et 1686 à des travaux de mathématiques pures ou appliquées, on ne trouve guère plus de deux ans et demi, en y comprenant la période employée à la préparation des *Principes*.

Les phénomènes naturels peuvent être étudiés de différentes façons. Les mathématiques, il est vrai, permettent de transposer la réalité en un langage commode et nous aident même à prévoir des faits nouveaux; en ce sens, on peut leur reconnaître un rôle créateur, encore que la voie uniquement expérimentale puisse autoriser peut-être les mêmes prédictions; mais elles ne constituent à tout prendre qu'un intermédiaire dont

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(26) A propos de la publication des *Principes*, il écrit à HALLEY le 1 mars 1687 : « I am obliged to you for pushing on the edition, because of people's expectation, tho' *otherwise I could be as well satisfied to let it rest a year or two longer* ».

(27) Signalons ici l'analogie frappante de l'idéal scientifique de NEWTON avec celui de ROGER BACON (que l'auteur des *Principes* n'a presque certainement jamais lu). La méthode qu'applique le moine franciscain — chez qui on retrouve la plupart des traits qui constituent l'essence même de la spiritualité anglaise, et cela bien avant que les peuples d'Angleterre aient pris conscience de leur individualité — se réduit à un empirisme coordonné par les mathématiques. Comme NEWTON, R. BACON envisage surtout les mathématiques au point de vue pratique, c'est-à-dire au point de vue de leurs applications. Il ne fit jamais le moindre effort pour démontrer un théorème. Comme NEWTON, il est bien plus physicien que mathématicien, mais, comme NEWTON aussi, il ne peut assez exalter le rôle des mathématiques dans l'étude de la nature : « Naturales mundi sciant quod languebunt in rebus naturalibus, nisi mathematicae noverunt potestatem. » Il ne serait pas difficile de multiplier les citations sur ce sujet.

le mérite essentiel est d'imposer la vérité de façon rapide et sûre.

Ainsi, NEWTON apparaît comme ayant été d'autant moins enclin à faire allusion dans sa lettre à la méthode des fluxions qu'il désirait au plus vite et définitivement se faire comprendre de HOOKE. Celui-ci d'ailleurs n'était peut-être pas au courant du nouveau procédé de calcul (28) ; il reste dès lors à se demander comment il obtint — en apparence du moins — certains résultats (29). Nous reproduisons ici une opinion de NEWTON qui contribuera sans doute à la solution de ce problème si intéressant : « He has done nothing, and yet written in such a way, as if he knew and had sufficiently hinted all but what remained to be determined by the drudgery of calculations and observations, excusing himself from that labour by reason of his other business, whereas he should rather have excused himself by reason of his inability. For 'tis plain, by his words, he knew not how to go about it. Now is not this very fine? Mathematicians, that find out, settle, and do all the business, must content themselves with being nothing but dry calculators and drudges; and another, that does nothing but pretend and grasp at all things, must carry away all the invention, as well of those that were to follow him, as of those that went before ». (30) Il est certain que HOOKE n'a pas toujours su franchir la distance énorme qui sépare les intuitions heureuses des démonstrations certaines. HOOKE était un génie d'une très grande profondeur et c'est un des savants qui honorent le plus l'Angleterre. Mais, il eut le tort de se satisfaire trop vite de conjectures qu'il ne prenait pas la peine de contrôler par le calcul (31).

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(28) « I doubt not that *by your excellent method* you will easily find out what that curve must be, and its proprietys... » (lettre de HOOKE à NEWTON, 17 janvier 1680).

(29) Cf. ci-dessous au n° [3].

(30) Lettre à HALLEY, 20 juin 1686.

(31) Il convient de noter ici que la *Micrographie* et les *Lectiones Cutlerianæ* ne contiennent à vrai dire pas une ligne de calculs. Un exemple frappant de la manière habituelle de HOOKE nous est fourni par le seul passage connu de sa lettre du 9 décembre 1679 : « *I could add many other considerations* consonant to my theory of circular motions compounded by a direct motion and an attractive one to the center... » De même, le 6 janvier 1680, il écrit : « ...in the celestiall motions the sun,earth,or centrall body are the cause of the attraction, and though they cannot be supposed mathematicall points yet they may be conceived as physicall, and the attraction at a considerable distance may be computed according to the former proportion as from the very center ». NEWTON aussi possédait intuitivement le théorème d'après lequel, pour étudier l'attraction exercée par

[3] Voici les principaux résultats auxquels on est conduit dans l'étude de la trajectoire d'un point matériel soumis à une attraction centrale constante, la vitesse initiale étant perpendiculaire au rayon vecteur passant par la position initiale (32). « I then took the simplest case for computation, which was that of gravity uniform in a medium not resisting—imagining he had learned the limit from some computation, and for that end had considered the simplest case first. And in this case I granted what he contended for, and stated the limit as nearly as I could » (lettre à HALLEY, 27 mai 1686).

La trajectoire du mobile pour une vitesse initiale donnée est composée d'arcs égaux dont chacun est vu du centre sous un angle constant

$$\alpha = \int_{-\frac{\pi}{2}}^{+\frac{\pi}{2}} \sqrt{\frac{1+\lambda \sin \phi}{3+\lambda \sin \phi}}\, \delta\phi \quad (1)$$

avec

$$\lambda = \frac{R-\rho}{R+\rho} \qquad (2)$$

R étant le vecteur initial supposé égal au rayon terrestre et ρ la valeur minimum du rayon vecteur, cette valeur étant la racine positive de l'équation

$$\rho + R - 2\,K\,\rho^2 R^2 = O \quad (3)$$

où $K = \frac{j}{v_0^2\, R^2}$; la trajectoire ne sera à l'intérieur de la terre que si $K > \frac{1}{R^3}$ ou $v_0 < \sqrt{jR}$; elle ne sera pas une courbe fermée, l'angle α étant incommensurable avec π.

« Your calculation of the curve described by a body attracted

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une planète, on peut supposer ce corps réduit à un point matériel de même masse coïncidant avec son centre; mais ce n'est qu'en 1685 qu'il en trouvera a démonstration. HOOKE, se basant sur sa lettre de 1680, ne manque pas de revendiquer pour lui-même la découverte du théorème.

(32) Si l'on ne fait pas l'hypothèse que la terre se réduit à un point matériel de même masse coïncidant avec son centre, on est ramené au problème de la détermination du mouvement des météores dans un essaim sphérique ou d'une étoile dans un amas globulaire, mais la résolution de cette question implique une hypothèse sur la relation qui donne la densité en fonction de la distance au centre. *Cf.* P. TEN BRUGGENCATE, Sternhaufen, Berlin, SPRINGER, 1927.

by an aequall power at all distances from the center, such as that of a ball rolling in a inverted concave cone, is right, and the two auges will not unite by about a third of a revolution » (33). HOOKE a donc observé qu'on peut ramener au problème traité par NEWTON l'étude du mouvement d'un point pesant assujetti à se mouvoir sur un cône de révolution, d'axe vertical et de rayon C A, reposant sur la pointe en C. On sait que cette équivalence des deux problèmes est une conséquence des équations intrinsèques du mouvement du point sur la surface conique. Si l'on songe que HOOKE ne s'est probablement livré à aucun calcul, sa remarque donne une mesure exacte de la profondeur et de la sûreté de son intuition. On peut noter aussi l'analogie de la courbe dessinée par NEWTON avec la projection de la trajectoire obtenue dans l'étude du problème du pendule sphérique, dans le cas où les deux parallèles extrêmes sont dans l'hémisphère inférieur.

Le lieu du point O est une courbe définie en coordonnés polaires [(C, CA), ρ, α] par les équations (1), (2) et (3); cette courbe est tangente à BC en C et passe par le point ($\rho = R$, $\alpha = \frac{\pi}{\sqrt{3}}$) correspondant à $\lambda = 0$; ceci ne concorde donc pas avec le résultat de NEWTON : « a certain curve w^{ch} touches y^{e} line BC at C & passes thence to D ». Il n'est d'ailleurs pas aisé de définir avec précision les propriétés du lieu O, puisqu'on se heurte à une intégrale elliptique. Cette difficulté n'a vraisemblablement pas dû surprendre NEWTON, habitué à pareille rencontre, et il a pu trouver une construction approchée, soit en discutant l'équation différentielle sans l'intégrer, soit en l'intégrant d'une manière approchée.

[4] Quant au cas de la gravité variable (34), supposons que celle-ci soit une fonction arbitraire de la distance au centre attirant. J. BERTRAND a recherché quelle devait être cette fonction pour que la trajectoire fût fermée : « ...deux lois seulement remplissent

(33) Réponse de HOOKE à NEWTON, 6 janvier 1680.

(34) « He replyed that gravity was not uniform but increased in descent to the center in a reciprocall duplicate proportion of the distance from it, and thus the limit would be otherwise than I had stated it, namely, at the end of every intire revolution, and added that according to this duplicate proportion the motions of the planets might be explained and their orbs defined » (lettre à HALLEY, 27 mai 1686).

les conditions demandées, celle de la nature (35), pour laquelle l'orbite fermée n'a qu'un axe de symétrie passant par le centre d'action, et l'attraction proportionnelle à la distance, pour laquelle il y en a deux » (36), ceci dans le cas où la vitesse initiale ne dépasse pas une certaine limite. « Les orbites planétaires sont des courbes fermées; c'est la cause principale de la stabilité de notre système, et cette circonstance importante résulte de la loi d'attraction qui, quelles que soient les circonstances initiales, fait mouvoir chaque corps céleste qui n'est pas expulsé de notre système, suivant la circonférence d'une ellipse. On n'a pas remarqué jusqu'ici que la loi d'attraction newtonienne est la seule qui remplisse cette condition.

Parmi les lois d'attraction qui supposent l'action nulle à une distance infinie, celle de la nature est la seule pour laquelle un mobile lancé *arbitrairement* avec une vitesse inférieure à une certaine limite, et attiré vers un centre fixe, décrive nécessairement autour de ce centre une courbe fermée. Toutes les lois d'attraction *permettent* des orbites fermées, mais la loi de la nature est la seule qui les impose ». (37)

En comparant ces divers résultats avec les trajectoires planétaires et la lenteur du déplacement des périhélies, NEWTON a donc dû se trouver en possession d'une indication précieuse sur la loi d'attraction, dont il entrevoyait l'exactitude à cette époque, mais dont cependant il ne possédait pas encore de démonstration certaine. Le document inédit qu'on a lu plus haut où — il importe de le remarquer — la loi de variation de la gravité en fonction de la distance au centre n'est pas énoncée (38), confirme donc la thèse récemment développée par Mr. CAJORI dans un article

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(35) « ... with such an attraction the auges will unite in the same part of the circle, and the nearest point of the accesse to the center will be opposite to the furthest distant, which I conceive doth very intelligibly and truly make out all the appearances of the heavens ». (Réponse de HOOKE à NEWTON, 6 janvier 1680).

(36) J. BERTRAND, *C. R. Ac. des Sc.* de Paris, séance du 20 octobre 1873.

(37) *id.*

(38) Il n'est fait non plus aucune mention explicite de cette loi dans la lettre « For Mr. CROMPTON to be sent to Mr. FLAMSTEAD » (Cambridge, 28 Fev. 1681) : « ... I can easily allow an attractive power in the sun, whereby the planets are kept in their curves about him from going away in tangent lines... » L'énoncé de la loi n'apparaît pas davantage dans un projet de réponse à FLAMSTEAD (16 avril 1681).

remarquable (39) : si NEWTON a retardé pendant près de vingt années la publication de la loi d'attraction, c'est parce qu'il la croyait une simple approximation : « Before 1685, NEWTON suspected that the law of inverse square was a mere approximation to the truth ». ***Contrairement à l'opinion courante, l'exactitude de la valeur du rayon terrestre n'eut rien à voir avec la question*** (40). [5] « ...And therefore (though in truth I agree with you that the explicating the curve in which a body descending to the center of the earth would circumgyrate were a speculation of noe use yet) the finding out the proprietys of a curve made by two such principles will be of great concerne to mankind because the invention of the longitude by the heavens is a necessary consequence of it,

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(39) *Sir Isaac Newton* 1727-1927, A bicentenary Evaluation of his work, London, BAILLIÈRE, TINDALL and COX, 1928 (*Isis*, 11, 387-93) ; *cf.* p. 127 : NEWTON's twenty years delay in announcing the law of gravitation, by FLORIAN CAJORI.

(40) Les idées de Mr. CAJORI nous paraissent si intéressantes que nous ne pouvons nous empêcher de reproduire ici à leur appui deux passages d'une lettre peu connue de NEWTON à FLAMSTEAD. Cette lettre n'est pas datée, mais fut écrite, selon FLAMSTEAD, en 1685 ou en janvier 1685-6 :

« ...I have not at all minded Astronomy of some years till on this occasion, which makes me more to seek... Now I am upon this subject, I would gladly know the bottom of it before I publish my papers.

...Your information about the error of KEPLER's table for Jupiter and Saturn has eased me of several scruples. I was apt to suspect there might be some cause or other unknown to me, which might disturb the sesquialtera proportion, for the influences of the planets one upon another seemed not great enough, tho' I imagined Jupiter's influence greater than your numbers determine it. It would add to my satisfaction, if you would be pleased to let me know the long diameters of the orbits of Jupiter and Saturn assigned by yourself and Mr. HALLEY in your new tables, that I may see how the sesquialtera proportion fills the heavens together with another small proportion, which must be allowed for ». (*A General Dictionary, Historical and Critical*, 1734-1741, (BAYLE) by BERNARD, BIRCH, LOCKMAN; vol. 7). Notons aussi les lignes suivantes dans le traité *de Motu* (troisième exemplaire de la collection Portsmouth, voir plus haut) : « Demonstratis igitur legibus reguntur motus in cœlis. Sed in aere nostro, si resistentia ejus non consideratur, innotescunt motus projectilium per Prob. 4 et motus gravium perpendiculariter cadentium per Prob. 5 posito nimirum quod gravitas sit reciproce proportionalis quadrato distantiae a centro terrae. Nam virium centripetarum species una est gravitas; et computanti mihi prodiit vis centripeta qua luna nostra detinetur in motu suo menstruo circa terram ad vim gravitatis [his] in superficie terrae reciproce ut quadrata distantiarum a centro terrae quam proxime. Ex horologii oscillatorii motu tardiore in cacumine montis praealti quam in valle liquet etiam gravitatem ex aucta nostra a terrae centro distantia diminui, sed qua proportione nondum observatum est. »

for the composition of two such motions I conceive will make out that of the moon ». (41)

[6] Le journal de HOOKE ne porte aucune indication à la date des 14, 15 et 16 décembre. Mais la lettre de NEWTON parvint à son destinataire, qui y répondit le 6 janvier 1680 :

Sun 4... — perfect theor. of Heavens —
Tues 6... Sent Letter to Mr. NEWTON.

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Nous nous proposons de revenir bientôt sur plusieurs questions intéressantes soulevées par la lettre publiée ici, notamment sur la contribution qu'elle apporte à l'histoire de la genèse des *Principes*.

Nous publierons prochainement d'autres inédits de NEWTON. Le présent travail a pu être achevé grâce à l'intervention du Fonds national belge de la Recherche scientifique.

Bruxelles. JEAN PELSENEER.

(41) Réponse de HOOKE à NEWTON, 6 janvier.

La Peste de 1763 en Dalmatie.

III. Appendice.

PIÈCES JUSTIFICATIVES. — NOTES.

Terminazione in materia di sanità per il contaggio sviluppatosi ne'Borghi di Spalato.

NOI PIETRO MICHIEL etc.

Alle caute disposizioni estese dal zelo di questo Illustrissimo Conte e Capitanio Dolfin, unitamente al Spettabile Colleggetto di Sanità sopra la fatale insorgenza del morbo pestilenziale reso manifesto in questo Borgo Grande nel dì 19 X.bre. prossimo scaduto, e diramatosi in appresso negl'altri, abbiamo data mano sollecita colla nostra comparsa sul luogo, ed aggiunte tutte quell'altre prouidenze, che relatiue alle Leggi del Maggistrato Eccellentissimo Supremo Presside nella materia, ed utilmente poste in pratica altre uolte, specialmente nell'anno 1731 uagliano con l'ajuto Diuino a spegnere l'orribile fiamma, che con giornaliere luttuosissime conseguenze diuampa trà queste infelici popolazioni.

Già disposta, ed armata la Linea di circonuallazione di detti Borghi con le diuisorie l'uno dall'altro, separate, e barricate le Case infette, stabiliti li Ospitali, li Lazzaretti per gl'infermi, per li sospetti, per li conualescenti, e per gli espurghi, non che li Cimiterj in opportune situazioni per li sotterramenti, restarono parimenti destinati con addattate commissioni li necessarj Sopraintendenti, e Deputati, con Medici, e Chirurghi, e l'altre persone tutte, che nelle respettiue mansione contribuir deuono l'opera loro.

Mà perchè da ciascheduno si abbia una sicura norma di dirrezione nelle peculiari sue incombenze, e delli modi con li quali dourà essere trattata questa gelosissima materia, ritrouiamo conferente di dichiarare, e comprendere nella presente Nostra Terminazione in separati, e distinti articoli li ordini, e le regole da osseruarsi in risserua di aggiungere successiuamente quell'altre prescrizioni,

e prouidenze, che si rendessero egualmente necessarie, e che fossero per deriuarci dall'ossequiata Auttorità del sopradetto Eccellentissimo Magistrato nell'importanza dell'argomento.

Inuocandosi però da Noi la misericordia dell'Onnipotente dalla quale principalmente si ha da confidare, e da riconoscere la sospirata calma, e liberazione dai mali presenti, ordiniamo, e terminiamo quanto segue :

Primo.

Qualunque persona di qualsiuoglia condizione, e grado, a risserua di quelle destinate in alcuna incombenza per le presenti emergenze non ardisca in qualsisia tempo sortire dai Recinti di questa Città per condursi in altri Luoghi, senza la partecipazione della Carica, sotto le più seuere pene, ed anco della uita, à misura della trasgressione.

2^do.

Se alcuno per sua fatalità si sentisse attaccato dal Morbo, dourà testo manifestarsi al Deputato cui spetta, ed anco a cognizione di tutti, sicchè prendersi immediate le misure già prescritte nel proposito, senza differirne l'importante notizia allorchè fosse agl'estremi, poichè uenendo scoperto in altro modo, sarà irremissibilmente punito nella uita, prima che soccomba alla uiolenza del male, alla qual pena s'intenderanno parimenti incorsi li Congionti, e qualunque altro concoresse a tenere occulta la persona colpita.

3^o.

Anco quelli, che si trouassero sorpresi da mali di altro genere saranno egualmente nell'obbligo di manifestarlo al Deputato sudetto, per quelle osseruazioni, e uerificazioni, che incombono alli destinati Medico, e Chirurgo, e ciò sotto le più seuere pene, ed anche della uita.

4^to.

Resta assolutamente proibita qualunque radunanza, e concorso, ed in particolare li funebri, tuttoche per causa di morti prodotte da mali non sospetti, sotto le pene più rigorose a quelli che u'interuenissero, e ui prestassero assenso.

5^to.

Si eccitano bensì li Religiosi, Chierici, e Regolari, affinchè non manchino li spirituali suffraggi alli poueri infetti, ed alli sospetti, di concorrere con la loro caritateuole assistenza, sempre però trà le douute risserue ad amministrare ad essi li S. S. Sacramenti, animandoli, e confortandoli nelle loro calamitose circostanze.

6^to.

Chiunque auuesse, o ritenesse appresso di se robbe, ed effetti di qualunque genere delle Case, e famiglie infette, o che le tenesse occulte, e sepolte, dourà sotto pena della uita palesarle a questa Carica, o alle persone deputate di Sanità, promettendo a' medesimi, che le dette robbe, ed effetti non saranno incendiati, ma conseruati per il competente espurgo, indi riconsegnate a' Proprietarj.

7^mo.

Cosi quelli, che fossero in cognizione d'attrouarsi robbe, ed effetti come sopra nascosti, douranno egualmente reccarne gl'auuisi, in pena pure della uita.

8^o.

Per rimouere le perniciosissime conseguenze, che deriuar possono nelle congionture presenti dal uagar di Cani, e Gatti, douranno e gl'uni, e gl'altri assolutamente essere uccisi, al qual effetto s'incaricano espressamente gl'Uffiziali Ispettori, li Deputati respettiui, ed ogni altra Pubblica persona, che s'attroua ne Borghi.

9^o.

Già interdetta la communicazione trà li luoghi infetti, ed altresì dei Territoriali co' Borghi medesimi, resta ingionto l'uso della maggior uigilanza al Sopraintendente alla Linea, ed alli Subordinati Capiposti, e Direttori sopra l'armo della medesima per la sua più esatta custodia, frequentando perciò le uisite, e le ronde specialmente di notte, onde mantenere nel pontuale esercizio dei loro doueri le Guardie, le quali auranno da far fuoco addosso a qualunque tentasse uiolare le frapposte segregazioni, coll'uscire dalli Recinti delle Linee, o penetrare clandestinamente in esse.

10mo.

Tutti gli abitanti presentemente ne Borghi douranno trattenersi nel Recinto delle loro Case finchè siano consumate le Visite delle persone Deputate, nelli tempi, e modi qui sotto espressi, e qualunque si ritrouasse fuori della propria abitazione prima della uisita stessa, massime in tempo di notte, incorrerà irremissibilmente nella pena della uita.

11.

Inuigilaranno per tal conto li accennati Direttori della Linea, e le Guardie esterne, ed interne, non meno che per impedire, onde non siano commessi furti, arerstando cautamente li Ladri, che colti col furto, saranno considerati rei di morte, e se facessero ressistenza, o uiolenza per fuggire, sarà loro fatto fuoco addosso.

OBBLIGHI DEI DEPUTATI, MEDICI, CHIRURGHI, ED ALTRI.

Primo.

Incomberà precisamente alli Deputati, o siano Capi di Contrada destinati nei respettiui Borghi, fatti diuidere in Sestieri, di trasferirsi in cadauna mattina, doppo il leuar del Sole unitamente all'assegnato Chirurgo, e coll'assistenza degl'occorrenti Guardiani alla uisita occulare con li douuti riguardi di tutte le Famiglie, e Case raccomandate alla loro ispezione, rileuare accuratamente lo stato di salute delle persone di cadauna Famiglia, rincontrandone di Casa in Casa il numero col Piedilista dell'anime appresso di loro esistente, e descriuere poi in Note distinte, da essi firmate, ed egualmente dal Chirurgo, ogni accidente, che uenisse loro di rissultare per auuanzarle immediate al Colonello Soprainten-dente Mazzuccato, che ha l'incombenza di riceuerle, e di riportare alla Carica ogni insorgenza, ed assieme un'esatto giornaliero Piedilista.

2do.

Ritrouandosi, o scoprendosi dalli Deputati sudetti qualche persona inferma in alcuna delle Case uisitate, dourà tosto colle neccessarie cautele essere diligentemente esaminata dal Chirurgo, e quallora la qualificasse coll'opinione del Medico deputato colpita

dal morbo pestilenziale, aurà tosto nelli cauti modi già preffissi da farsi passare agl'Ospitali destinati ad uso degl'infetti, e li restanti della Famiglia negl'altri luoghi, o siano Lazzaretti riseruati per li sospetti, li quali douranno collocarsi possibilmente diuisi l'uno dall'altro, e procedersi indi alli neccessarj espurghi, preuio il cambiamento de loro uestiti, con l'immersione de corpi nudi in Mare, se la Staggione lo comportasse ouero con l'abluzione di accetto, ed assieme col profumo antipestilenziale. Dourà auuertirsi tosto sgombrata la Casa degl'abitanti di far ben chiudere, ed assicurare tutte le Finestre, Fori, e Porte, barricarui gli accessi, apponerui le neccessarie fedeli custodie, e contradistinguere la Casa stessa con la marca di un segno osseruabile.

3°.

Lo stesso metodo dourà egualmente osseruarsi per quelle Case, nelle quali si trouasse alcun estinto con segni, o indizij del fatal morbo, de quali accidenti come sopra raguagliato il Colonello Sopra-intendente si farà tradurre il Cadauere dai destinati Beccamorti premuniti dei soliti uestimenti, e d'istrumenti nelli modi preffissi alli Cimiterj stabiliti, doue sotterrarsi nudo il Cadauere stesso alla presenza del Deputato alli sotterramenti in Fossone formato nelle fissate proffondità, per ricoprirsi con Calcina uiua, et indi con terra copiosa, finchè il piano resti uguagliato alla superfizie.

4^to^.

Dourà procedersi in conformità dal Deputato, e Chirurgo destinati alle respetiue ispezioni delli Lazzaretti delli sospetti nel Castello Capogrosso, e nell'altro di San Steffano all'occasione delle loro uisite giornaliere, tanto in rapporto a quelle persone, che si scoprissero infette, come per gli altri, che mancassero di uita.

5^to^.

Coll'incontro dell'accennate quotidiane uisite auranno anco da somministrarsi ad ogni uno i neccessarj alimenti, a misura della costituzione nella quale s'attrouassero giusta le commissioni già rilasciate nel proposito al predetto Colonello, et alli Deputati per tal conto, e prestarsi loro quegl'altri souuegni, che si rendessero indispensabili, e particolarmente di Medicinali, proffumi, accetti, Vini, et altro.

6to.

Superandosi dagl'infetti la malignità del morbo, trascorsa che sia la prima quarantena, si faranno passare nell'altro luogo scielto come Lazzaretto dei Conualescenti, preuie le già descritte diligenze dell'immersione de Corpi nudi in Mare, ouero delle abluzioni con accetto, e de proffumi, con la mutazione de loro uestiti.

7mo.

Anche in questo secondo Lazzaretto saranno quotidianamente uisitati dalli Deputati, e Chirurghi per riconoscere se nel corso della quarantena seconda si manifestasse in alcuna contumazia qualche segno d'infezione per far ritornare immediate il colpito sotto la classe degl'infetti con la nuoua segregazione delle persone, che seco lui s'attrouassero, e con li metodi, ed auuertenze di sopra dichiarite.

8o.

Ma consumata la seconda quarantena senza nouità, passaranno nel terzo luogo ad uso di rispetto, doue saranno trattenute le persone, che licenziate fossero dalla contumacia de sospetti, parimenti questo terzo luogo caderà sotto l'ispezione del Deputatto ed alle neccessarie giornaliere Visite, custodito come gli altri da Guardie, e regolato nei modi, e per quel periodo di tempo, che opportunamente saremo per addittare.

METODO PER GL'ESPURGHI DELLE MOBILIE INFETTE, E SOSPETTE.

Primo.

Sgombrata dagl'abitanti tutti la Casa infetta nelli modi già sopra dichiariti dourà coll'interuento del Deputato a tal ispezione asportarsi, e condursi dalli destinati Bastazzi ogni mobilia col mezzo di Casse, di Ceste, o di Sacchi incatramati al luogo stabilito per il loro espurgo, doue assoggetarsi imediate le robbe di Lana, e simili all'immersione nell'acqua di mare per più giorni, e quallora fossero euidentemente infette, o molto sucide auranno da soggiacere al tormento del Lissiuo, o sia acqua bollente con cenere per un'ora, a misura della prudenza di chi dirige.

2^do.

Le robbe di setta, ed altresì li pellami si esponeranno sopra le Corde preparate allo Sborro, ed auranno a trattarsi con proffumi forti, indi ben maneggiarsi, e uentilarsi, scuotendole con Bastoni, e tutto ciò per più, e meno di tempo, secondo il maggiore, o minore sospetto, dalli destinati Bastazzi, considerato però sempre, come tratto più breue il periodo di giorni quaranta da osseruarsi in tale occasione.

3^o.

Le Carte scritte, piture in carta, e simili aueranno ad essere diligentemente proffumate, ed abbrucciati li filli, e spaghi, che ui fossero attaccati, auertendo, che le piture in Tella doueranno inoltre essere esposte all'aria, e uentilate come sopra.

4^to.

Li Tamici si laueranno con accetto, e dourà attuffarsi nel Lissiuo bollente tutto ciò, che di terra, o di altro fosse formato, come Vasi, Zappe, e cose simili.

5^to.

Le Case, Tauole, Banchi, Scanzie, Armari, e consimili douranno lauarsi, e rilauarsi con acqua bollente, indi lasciarsi esposte all'aria, per qualche tratto di tempo.

6^to.

Li fodri di Palosso, le Patrone, e cose simili saranno poste pure nell'accetto, come altresì li Coltelli, Britole, ori; et argenti, manichi d'osso, e d'auorio saranno immersi nell'Acqua, o nell'accetto, secondo il maggior, o minor sospetto.

7^mo.

Incomberà alli Deputati Ispettori agli accennati espurghi d'assicurarsi con la cauta locale, e continua loro presenza, che non solo si eseguiscano le broue, immersioni, proffumi, e sborri, mà che a tutto rigore facciano li Bastazzi il diligentissimo quotidiano maneggio, da cui dipende la proua concludente dell'espurgo.

8°.

Stabiliti li Bastazzi di due sorti, li primi sporchi auranno da riceuere, trasportare, ed applicare alla bollitura le robbe infette, e sospette, e li secondi netti saranno per consumare li prescritti espurghi nel luogo all'effetto destinato.

9°.

Per solleuare poi in parte li Deputati all'impegno di descriuere le robbe da espurgarsi, e perchè non succedano confusioni, e smarimenti delle medesime ui si aggiungerà l'interuento de respettiui Parochi, o di altri Sacerdoti di nota probità per formarsi le note, ed Inuentario esatto degl'effetti di cadauna Famiglia, facendo quelli marcare in modo, che non si confondano, ma che integralmente siano trasportati nel sito dell'espurgo.

10.

Dell'accennato Iuentario firmato giuratamente dal Parroco, e dagl'altri Ispettori dourà consegnarsi una copia a quest'Ufficio di Sanità, e l'originale essere custodito nella Cancellaria dell'Illustrissimo Rappresentante, a fondamento delle ragioni, che respettiuamente compettissero.

11.

Seguito il formale espurgo delle robbe sudette, saranno esse traddotte nell'altre Case affatto libere, destinate a tale occorrenza.

12.

Già stabilite apparte le regole da osseruarsi per l'admissione ed espurgo de uiueri, e comestibili prouenienti da Luoghi infetti, e sospetti, niente per ora ci resta d'aggiongere in questo proposito.

REGOLE PER L'ESPURGO DELLE COSE INFETTE.

Primo.

Le Case fabricate di Muro in Calcina, e coperte di Coppi, precesso già sempre il trasporto di tutte le robbe, douranno lasciarsi aperte intieramente al libero passaggio dell'aria, et indi incominciarsi gli espurghi con li proffumi, al qual effetto la mattina

per tempo col mezzo dei Beccamorti, e degl'altri seruenti sporchi sarà introdotto un forte proffumo fatto col Solfo, assa fettida, Corni di becco raspati, e minutamente tagliati, poluere da schioppo Catrame, e simili sopra brace accese, entro di una, o più Pignatte di Terra cotta a proporzione de luoghi spaziosi, o diuisi in più Stanze, e ben chiusi li Balconi, e le Porte, ue lo lasciaranno per uentiquattro ore.

2^do^.

La mattina del giorno uenturo un'ora doppo leuato il Sole si aprirà tutta la Casa, e lasciatala mutar d'aria, ui entraranno li Proffumatori, tenendo in mano mazze di Frasche accese, e fumanti di ginepro, Osmarino, ed altre piante odoriffere, e girando con esse per ogni angolo, ripassaranno con le medesime ardenti le Mura, e li Soffitti, ricercando minutamente ogni parte, e ripostiglio per snidare, et abbrucciare le Telle di Ragno, ed ogni altra cosa, ed immondicia non meno facile a riceuere, che a conseruare la contaggiosa infezione, loche eseguito, si spazzarà diligentemente da per tutto, e nella sera si repplicaranno dello stesso modo i sopradetti forti proffumi.

3^o^.

Nel susseguente giorno con acqua di Mare dourà farsi una generale lauanda de Muri, soffitti, ed anco de pauimenti, e Solari, raschiandoli, e stropizziandoli ben bene, ed insinuando di tal acqua in ogni picciola apertura di Muro di Tauola, o di altro Legname.

4^to^.

Per due giorni auuenire si farà stare aperta la Casa, spazzandola con diligenza uerso la sera all'occasione di soliti proffumi, e nelli successiui due giorni si lauaranno e Muri, e Soffitti con accetto forte, ed in mancanza di questo si adoprarà l'acqua in cui sia stata estinta Calcina uiua.

5^to^.

Si lasciaranno passare altri due giorni, nei quali però si repplicarà la diligente spazzatura della Casa, ed il proffumo come sopra, et indi si passarà alla terza generale lauanda con la sudetta acqua

di Calcina, preuia però l'imboccatura, e l'incarto con calcina doue occorresse.

6to.

Non potrà in appresso più introdursi la Gente sporca, e si lasciaranno spalancate le porte, e Balconi di giorno, e di notte, attendendo il benefizio di un gagliardo uento boreale, doppo di che da Gente netta si daranno a tutta la Casa due, o tre mani d'acqua di Calcina, ed in seguito ui si metteranno per più giorni repplicati proffumi dolci di foglie, e bacche di ginepro, Osmarino, Saluia, Lauanda, Surpillo, Timo, Incenso, e cose simili. Ciò compito si lasciarà la Casa aperta al libero passaggio dell'aria, sinchè ritornino li Proprietarj ad abitarla.

7mo.

Le Case fabricate di Muro a secco, se imboccate, o incartate in Calcina, saranno espurgate in conformità delle sopradette di Muro in Calcina, incartandole però di nuouo al di dentro, e ricercando pur minutamente al di fuori ogni bucco, e fissura accioche non ui resti della robba sospetta. Se poi non fossero nemmeno imboccate douranno disfarsi totalmente, riponendo, e sassi, e pianche in situazione, ed in modo, che possano sempre essere leuate, e spurgate dalla pioggia, e dall'aria, raccogliendosi poscia per abbrucciarsi li rimasugli unciosi, e poluerosi, che s'attrouassero nella Masiera.

8o.

Il Legname uecchio, e tarlato dourà parimenti incendiarsi: il nuouo e non pregiudicato si lauarà repplicatamente, e quello che non fosse appianato conuerà in prima passarlo, e ripassarlo da ogni lato sopra la uampa del fuoco per abbrucciarne quella pelluria, e sfilazze, che potrebbero contenere in se l'infezione.

9o.

Trouandosi alcuna di tali Case con qualche esteriore parete, o facciata di Falasco, consumati che siano li prescritti proffumi, e la seconda lauanda, dourà lauarsi cautamente il detto parete, o sia facciata, e darsi alle fiamme il falasco, esaminandosi accuratamente le pianche del Tetto, in cui potrebbero lasciarsi doppo l'ad-

dittato diligente esame, soltanto quelle, che formano la gronda nella facciata medesima.

10.

Se gl'indicati Tetti coperti di pianche fossero bassi in modo, che somministrar potessero facilità a nasconderui robbe dentro le pianche medesime, auranno intieramente da disfarsi per riponersi le dette pianche con le uauertenze sopraccennate in luogo appartato.

11.

Le Case formate di Falasco, o siano Capanne douranno essere incendiate, a risserua dei soli palli, che le sostengono, semprechè questi meritassero l'espurgo prescritto per il legname nuouo e non pregiudicato.

12.

Nelle Case semplicemente sospette si praticaranno le abluzioni, li proffumi, e l'imbianchimento con calcina.

13.

Si farà particolar studio, ed impegno de Deputati agl'accennati espurghi, perchè sia estesa una diligentissima ricerca all'intorno delle Case, negli Orti, Cortilli, ed in ogni angolo, facendoui leuare tutte le straccie per incendiarle, e ritrouandoui robbe abbandonate, o nascoste, che fossero di qualche rilieuo, douranno mandarsi all'espurgo come infette.

14.

Per facilitare le scoperte delle robbe nascoste, si eccitano anco li Sacerdotti d'insinuare alle Famiglie superstiti a suellare, et indicare li nascondigli, con la sicurezza, che preuio il caritateuole, e diligente espurgo, e maneggio, saranno tutte le robbe restituite alli Proprietarj, o loro legittimi Eredi.

15.

Negl'Orti, nelli Cortilli, o in altri Luoghi doue la Terra fosse rugosa, o coperta di Erba, auerà la medesima da rouesciarsi,

perchè nel caso fuggisse dall'osseruazione qualche rimasuglio di robba infetta, resti coperto dalla Terra, e marcisca l'umido di essa; ladoue poi il Terreno fosse nudo, arrido, e piano, oppure celciato, sarà fatto spacciare diligentemente, e darsi alle fiamme le spazzature.

16.

Per maggior cautela si spargeranno le strade, e le superficie infette, di paglia, o brusca, sicchè dandogli fuoco uenga d'incenersi il ressiduo, che ui fosse d'ogni contaggiosa semente.

17.

Gli altri incendj delle Strazze, e Spazzature auranno sempre da eseguirsi in Campagna aperta, e nella possibile maggior distanza dalle Case con fuoco gagliardo, fermandosi soprauento gli esecutori.

18.

Tanto li Deputati Ispettori all'impegno delli sopradescritti espurghi, quanto li Seruenti destinati, douranno procedere con le maggiore circospezioni, e diligenze nel pontuale, e più esatto adempimento degli espurghi medesimi, poichè ommessa, o trascurata ogni benchè minima circostanza riprodur potrebbe nuoue funestissime conseguenze.

19.

Li Beccamorti douranno essere trattennuti, e custoditi nelli luoghi appartati per essi espressamenti disposti, onde non abbiano liberta di uagare, ed al caso d'impiegarli nelle loro funzioni, doueranno essere scortati da un Guardiano, e custoditi da Guardie armate in compettente distanza, accordandosegli un Magazzeno ben chiuso, doue riponere le loro robbe, per essere anco queste in appresso assoggettate alli necessarij rigorosi espurghi.

Per le sopradette ispezioni dourà farsi peculiare la cooperazione di questo Spettabile Colleggetto di Sanità assistito dal zelo del N. H. Rappresentante, e li respettiui Deputati, dal Colleggetto stesso prescielti nelle uarie mansione sotto la responsabilità della propria uita auranno personalmente d'agire, accorrere, ed inuigilare per l'osseruanza più scrupolosa delli riguardi della materia nelle respettiue incombenze loro commesse, non che per diuertire

le abusiue, e disordinate confidenze di chiunque, e massime de Seruenti in uiolazione delle salutari ordinazioni. Ed affinchè in ogni tempo sia rileuata la uerità, e riconosciuta la contumacia di quelli, che trasgredito auessero in alcuna benchè minima parte le ordinazioni medesime, le quali tendono non meno all'esenzialissimo oggetto della commune presseruazione, che a solleuare gli afflitti, ed a conseruare agl'infelici superstiti le loro sostanze, restarà aperto Processo d'Inquisizione per uenir in chiaro delle delinquenze, e dei delinquenti, onde abbiano irremissibilmente soggiacere al uigor delle Leggi.

La presente intanto dourà essere auuanzata in copia al sudetto N.H. Pubblico Rappresentante, e Colleggetto per l'immediata sua pubblicazione nella Città, e ne Borghi in quella parte, che si rende neccessaria all'intelligenza uniuersale, e per recarla a lume delle particolari persone Deputate dal Colleggetto stesso giusto le Nostre ordinazioni nelle respettiue mansioni, per l'adempimento degl'oblighi e metodi ingionti. Saranno parimenti accompagnati gli esemplari alli due Sopraintendenti Colonello Mazzuccato, e Tenente Colonello Rado, a necessario loro lume. In quorum fidem etc.

Dato in Spalato li 12 Gennaro 1763 M. V.

(Atti del Provveditore Generale Pietro Michiel 1763-1765, Libro I, Carte 110-116.)

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NOI PIETRO MICHIEL etc.

Mentre siamo applicati con il maggior feruore, e con ogni più attento studio all'importantissimo premuroso oggetto di togliere i progressi al Contaggioso pestilenziale Morbo, che arde, e serpeggia in questi Borghi, e massime nel Grande, con fatali luttuose conseguenze, doppo aver già fissate con la Terminazione Nostra de di 12. del corrente quelle salutari regole, e providenze, che abbiamo credute più efficaci, ed addattate alla graue conseguenza, trouiamo necessario di aggiungerui quell'altre ordinazioni, e cautele, che a maggior presidio della materia si reputano conferenti anco con il parere di questo Spettabile Colleggetto, e quindi

con la pubblicazione del presente ad uniuersale intelligenza chiamar tutti in generale, ed ogni uno in particolare alla più pontuale, ed esatta esecuzione, in pena della uita, in cui caderà irremissibilmente chiunque osasse di contrauenire in alcuna benchè minima parte.

Confermandosi perciò quanto è stato preffisso con il Capitolo X^mo della Terminazione precedente, cioè, che gli abitanti stessi de Borghi, abbiano, e debbano trattenersi chiusi, e custoditi nel Recinto delle respettiue Case finoche dalli Deputati stabiliti siano consumate le destinate giornaliere uisite all'effetto, e nei modi più precisamente espressi, si dichiara di presente, con la mira di promouerne l'adempimento, e di togliere ad un tempo alla malizia qualunque prettesto, che al terminar delle uisite medesime sarà dato un segno distinto con la Campana delle Chiese Maggiori.

A questo segno sarà lecito, e permesso al solo Capo di Famiglia per le necessarie prouuigioni de uiueri a' suoi Domestici di uscir di Casa, chiudendo tutti gli altri in essa, li quali tutti douranno rigorosamente trattennersi nelle respettiue Stazioni, senza mai per il periodo di giorni quaranta poter uscire per qualsiuoglia causa, in pena della uita.

E perchè se alcuno fosse tanto temerario di contrauenire ad una cosi prouida ordinazione possa anco facilmente essere conosciuto, e distinto, si prescriue, che tutti li Capi di Famiglia abbiano imediatamente darsi in nota ai Deputati alle Visite, per esserne da essi tenuto registro, e trasmessa una Copia alla Carica, per lume, e quindi il solo, che sarà dato in Nota, e non altri, s'intenda quello, che sarà in libertà di poter all'oggeto proposto uscir dalla propria Casa, il quale poi nella necessità indispensabile di prouedersi d'acqua, potrà seco condurre ai Pozzi communi la propria Moglie, o la Figlia, ouero la Sorella, o Serua, con obligo preciso di starui sempre a latto, e di subbito ricondurla lui stesso alla Casa, doue rinserrarla, onde pur essa si mantenga al destino degl'altri.

Si dichiara inoltre, che alle ore uentitrè di cadauno giorno durante la quarantena sarà dato un nuovo segno di Campana, in uista del quale abbia ogn'uno, e debba senza alcuna fraposizione di tempo a rimettersi alle respettiue abitazioni, da doue non sarà pure agli stessi, niuno eccettuato, più permesso di uscire fino all'altro tocco di Campana della mattina seguente, in pena della uita.

Con la mira poi, che questo interdetto non si renda inofizioso, ma se n'abbia anzi a riceuere utile uantaggio, in altro modo s'incaricano i Deputati suespressi di prescriuere ad ogni Casa, escluse già l'infette, e le sospette, le quali rese uacue delle persone, deuono continuar chiuse, e ben custodite, e di ponere allo Sboro netti gli effetti loro suscettibili, e giornalmente uentilarli, affinchè assicurarsi da ogni, e qualunque sospizione, che in così gelosa materia ui potesse correre, incaricandosi li respettiui Deputati a uegliare con ogni diligenza, perchè da ogni, e qualunque Casa sia di giorno in giorno cosi esequito.

Il presente dourà essere accompagnato al Spettabile Colleggetto, per l'effetto, che sia ben tosto fatto publicare in cadaun Borgo, per il suo pontuale adempimento. In quorum fidem etc.

Spalato 14. Gennaro 1763 M. V.

(Atti del Provveditore Generale Pietro Michiel, Libro I, Carte 116-117.)

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NOI PIETRO MICHIEL etc.

Per le nuoue scoperte, che si uanno facendo alla giornata di persone attaccate dal pestifero morbo in questi Borghi, abbiamo giusto mottiuo di dessumere, che non uenga prestato il douuto pontuale adempimento alle salutari ordinazioni da Noi preffisse nel proposito, specialmente con li Capitoli 2, 3, 6, 7, della Terminazione Nostra dei 12 Gennaro scaduto, fatta publicare nei Borghi medesimi, a notizia uniuersale, e consegnata alli respettiui Deputati in quella parte, che riguarda le respettiue loro ispezioni.

Ignote tuttauia le cause del grauissimo disordine, da cui principalmente ne deriua la continuazione de funesti progressi, rendendosi perciò inutili li mezzi, e li prouedimenti sino ad ora addattati per arrestarne il corso, trouiamo necessario col presente Nostro di richiamare rissolutamente all'osseruanza le ordinazioni accennate, aggiungendo quel di più, che riputiamo ualeuole nelle presenti contingenze a promouere il desiderato effetto.

Faciamo però publicamente intendere, e sapere :

Che qualunque persona di qualsiouglia condizione abitante ne

Borghi sudetti si sentisse o sospettasse di essere colpita dal Morbo, debba manifestarsi immediate non solo alli proprj Domestici, ed a chiunque altro se gli presentasse, ma altresì al Deputato, o Capo del Sestiero cui spetta, per le prescritte ulteriori disposizioni, poichè uenendo di scoprirsi in altro modo, sarà iremissibilmente fatto moschettare prima, che soccomba alla uiolenza del male, ed alla pena medesima si intenderanno pure incorsi li Congionti, e specialmente il Capo della Famiglia, non meno che qualunque altro fosse concorso a tenere occulte il male.

Neccessarie le medesime auuertenze nelle correnti gelosie anco per quelli, che si trouassero sorpresi da mali d'altro genere, saranno egualmente nell'obbligo di manifestarsi senza il minimo ritardo al Deputato del suo Sestiere, per le opportune uerificazioni, ed in caso di trasgressione incorreranno nella stessa pena della uita.

E siccome è probabile, e l'esperienza lo dimostra, che le nuoue scoperte infezioni traggano l'origine da robbe, ed effetti usati, o maneggiati antecedentemente da persone infette, ed in seguito trattenuti, ed occultati nelle respettiue Case, o in altri luoghi, douranno tutti quelli, che auessero, o ritenessero appresso di se per qualunque ragione, titolo, e causa delle accennate robbe, ed effetti di qualunque genere palesarle immediate alli respettiui Deputati, in pena irremissibile della Vita, promettendo intanto loro per questa uolta l'impunità, per auerle tenute occulte, e la sicurezza assieme d'essere pontualmente restituite alli Proprietarj doppo il compettente espurgo.

Dello stesso modo saranno tenuti a manifestare le robbe, che per auuentura s'attrouassero in qualche luogo nascoste o sepolte di ragione delle persone estinte, o attualmente infette dal morbo quelli, che ne tenessero qualche traccia o indizio, ben certi di conseguirne premio corrispondente, per cui si risserua opportunamente la Carica, ma nel caso risultassero in qualche modo, ed in qualsisia tempo colpevoli dell'osseruato pernicioso silenzio, soggiaceranno alla sopradetta pena della Vita.

Dipendendo principalmente dall'opera de Deputati, o siano Capi de Sestieri di scoprire, e riconoscere le contrafazioni sull'Importante argomento delle persone nuouamente attaccate dal Morbo, e che auessero procurato di tenersi occulte, resta loro espressamente rinnouato l'incarico, per l'uso delle maggiori diligenze, e perquisizione all'occasione delle prescritte giornaliere uisite delle

persone tutte, niuna eccettuata delle Case dei respettiui Sestieri, le quali persone con li metodi stabiliti ad una per una doueranno da loro rincontrarsi, ed esigersi sul fatto li più ueridici, e sicuri riscontri dello stato di salute di cadauna, con l'assistenza del Chirurgo, ed in caso di minima ommissione, o negligenza, che uenisse a scoprirsi nelli Deputati medesimi, soggiaceranno pur essi alle pene più seuere prescritte dalle Leggi di Sanità.

Si repplica anco col presente alli Deputati stessi, o siano Capi di Sestieri l'altra non meno esenzialissima incombenza, perchè giornalmente siano uentilate, e posti allo Sboro gli effetti tutti suscettibili delle Case non infette delli predetti Borghi, a tenor del Proclama della Carica 14. Gennaro scaduto.

Il presente dourà essere trasmesso a questo Spettabile Colleggetto di Sanità, non che al Sopraintendente general Colonello Cicauo per lume, e per la respettiua sua pubblicazione in cadauno de Borghi sudetti, sicchè cada a cognizione uniuersale, e prestarsi abbia da ciascheduno per la parte, che le incombe il pontuale suo adempimento. In quorum fidem etc.

Spalato li 6. Febbraro 1763. M. V.

(Atti del Provveditore Generale Pietro Michiel, Libro I, Carte 119-120.)

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Proclama in materia di sanità per l'armo della linea ond'impedire l'introduzione del contaggio.

NOI PIETRO MICHIEL etc.

Ha impegnato le Nostre più serie applicazioni fino da primordj dell'intrapreso Generalato la molesta insorgenza del Contaggio nella Città del Serraglio, da cui diramatosi in seguito a Fionizza, Zeppe, Prussaz, Scopie, nelli Vacup, et in altri luoghi della Confinante Bossina, uà tuttauia serpendo con funesti progressi, e si traspira già auuanzato nelle uicinanze del Triplo, e sopra la Confinazione d'Imoschi. Con la mira però di tuttelare da sourastanti pericoli la salute della Prouincia, si è rinforzato l'armo dell'intiera Linea con Milizia regolata, ed abenchè sempre ferme sul graue

argomento le regole già stabilite dall'autorità del Magistrato Eccellentissimo alla Sanità degli Eccellentissimi Proueditori Generali Nostri Precessori, e Proueditori sopra la Sanità in Prouincia, non che dall'ordinarie Rappresentanze, e Colleggetti delle respettiue Città, e Fortezze, abbiamo estese ad ogni modo in cadauna parte tutte quelle maggiori precauzioni, e prouidenze, che riputassimo non meno utili, che necessarie al fine proposto con Lettere Nostre, e Proclami a tutte le Frontiere, e loro N. N. H. H. Rappresentanti, e con pressantissime commissioni rapporto al debito degli instituiti Sopraintendenti, ed Inspettori alla Linea, de Capi de Territorj, dei Corpi uolanti, e del procedere delle Carauane andanti, e uenienti. Ma per assicurare maggiormente gli esenzialissimi riguardi della gelosa materia, e preuenire più che sia possibile le conseguenze di qualunque minima licenza nell'importante proposito, in uista massime del genio scorretto de Territoriali ripugnante alla disciplina, trouiamo opportuno di richiamare a memoria, et alla pontuale osseruanza le corse ordinazioni, ed aggiungerne dell'altre, onde adempite dal canto Nostro le parti tutte dell'umana diligenza, altro non resti che d'inuocare sopra di esse la protezione Diuina. Facciamo però col presente Proclama publicamente intendere, e sapere, essere Nostra ferma, e risoluta uolontà, che sotto pena iremissibile della Vita abbiano ad esequirsi in cadauna parte da qualsiouglia condizione di persone tutte le seguenti regole e prescrizioni.

Primo.

Non dourà che si sia oltrepassare nello Stato Ottomano, senza gl'indispensabili Passaporti rilasciati dal Pubblico Rappresentante per li quali dourà esibire in quell'Officio idonea pieggiaria di restituirsi alla propria Casa, rassegnandosi al Posto destinato, per essere poi assoggettato al prefisso periodo dell'espurgo.

2do.

Le persone, e Famiglie Suddite de respettiui Territorj, che a motiuo de loro negozij, ed interessi tuttauia s'atrouano di là della Linea entro le Tenute Ottomane, douranno nel recedere parimenti rassegnarsi ai Posti destinati sopra la Linea stessa, ed assoggettarsi alle già prescritte riserue, ed espurghi, con quelle

maggiori auuertenze, che saranno credute opportune dalli N. N. H. H. Publici Rappresentanti.

3°.

Resta assolutamente proibito qualunque transito, e regresso de Sudditi Nostri dal Paese Ottomano con Animali, Merci ed effetti suscettibili, poichè in riguardo al bisogno del commercio attiuo, e passiuo con li Sudditi Turchi per occasioni di uendite, e permute dei generi permessi, dourà ciò intendersi accordato in quelli soli luoghi del Confine a tal oggetto destinati, e custoditi di guardie, con le condizioni, e regole pratticate in simili casi, e prescritte agl'Inspettori, e Direttori de Posti, doue aueranno a ridursi per le uie solite, e notorie.

4^to^.

Tuttoche pressidiata la Linea, non impossibile però, che s'auuanzi la temerità di alcuno d'introdursi clandestinamente, deludendo la uigilanza delle guardie, resta rigorosamente uietato a chiunque di accompagnarsi in uiaggio, o dar ricetto in qualsiuoglia luoco sotto qualunque imaginabile colore, o prettesto a simili persone, o alli loro Animali, et effetti.

5^to^.

Per imperdire le furtiue introduzioni douendo inuigilare, e tenersi in continuo mouimento li Corpi uolanti a ciò destinati, coll'arrestare li contraffatori, e li loro effetti, inseguirli, et anco amazzarli in caso di fuga, o di ressistenza, auranno tutti gli effetti fermati da applicarsi a benefizio, e mercede di essi Capi uolanti, salua sempre la ricognizione nelle respettiue Bazzane degli effetti non suscettibili, lo sguazzo degli Animali, ed altresi il formale, e più regolato espurgo per le robbe suscettibili nelli Lazzaretti di Spalato.

6^to^.

Di cadaun fermo che fosse esequito dourà il Direttore del Corpo uolante farne consapeuole il più uicino Capoposto, perchè partecipato da questo il natural suo Rappresentante, siano successiuamente auuanzate le notizie alla Carica.

7mo.

Nel caso, che dai Corpi uolanti si usasse trascuragine maliziosa, dissimulazione, o concerto con li malfattori, o si mescolassero pur maliziosamente con persone, e robbe sospette, doueranno da Capiposti, e Direttori, o da qualunque altra persona, cui cadessero a notizia tali trascendenze esserne imediate partecipata la Publica Rappresentanza, con la sicurezza anco d'essere tenuto secreto, e premiato il Denonciante.

8o.

Anco le Sentinelle, e Guardie de Caselli alla Linea, allorchè mancassero nella debita uigilanza, e pontualità cosi nel star fisse a proprij Appostamenti, come nell'opponersi risolutamente a chiunque tentasse d'introdursi clandestinamente nello Stato, saranno imediate leuate dal Posto, e consegnate nelle Forze di quel Publico Rappresentante, nella di cui Giurisdizione uenissero di scoprirsi tali mancanze, per l'esemplare loro castigo.

9o.

Sarà obligo preciso de Capi, e Direttori respettiui di frequentare le uisite di giorno, e di notte alli Posti, per tenere nell'esercizio pontuale dei loro doueri le guardie, e prouedere sul fatto a qualunque disordine, che ui scoprissero.

10mo.

Inuigilaranno egualmente con particolar cura, ed auuertenza li Capi, ed Inspettori nei luoghi destinati al Confine per le permesse permute, e uendite, affinchè osseruandosi, come fu loro prescritto, le più scrupolose risserue, non siano prettese indebite contribuzioni, e pratticate estorsioni dalle guardie, o altri, a prettesto di regalie uerso li Sudditi, che si presentassero per il rifferito motiuo, sopra di che saranno sempre responsabili alla Carica li Capi, ed Inspettori sudetti.

11mo.

Infermandosi alcuno nelle Ville con qualche accidente di sospetto, sarà debito preciso di quel Karambassà di portarne l'auuiso con tutte le circostanze al Capoposto più uicino, e da questo parteciparsi immediate l'Uffiziale Superiore, da cui sarà sollecita-

mente auuertita la Publica Rappresentanza, per farne pratticare le necessarie uisioni col mezzo di Medico, o Chirurgo, o di altre esperte persone, onde rileuare la precisa qualità del male, non permettendo frattanto la comunicazione di quella con l'altre Case, e Famiglie, che dourà anzi essere custodita con particolare gelosia dalle Guardie.

12^do.

Succedendo la morte di alcuno improuisamente, dourà subito segregarsi egualmente quella Famiglia dal commercio con le altre, et appostarsi guardie a proporzione del sito, nè sepellirsi il cadauere fino a tanto che non siano pratticate le prescritte osseruazioni d'ordine della Publica Rappresentanza, da parteciparsi sollecitamente dell'emergenza come sopra.

13^o.

Già fissate le regole per l'introduzione, e scorta delle Carauane prouenienti dallo Stato Ottomano, massime con la prouida Terminazione dell'Ecc.mo Signor Proueditore alla Sanità Contarini 15. Maggio 1732, non è da dubitarsi, che genti, e Caualli dal corpo di esse possano distraersi in uiaggio, o uiolare le gelose riserue, sempreche ui si presti la prescritta uigilanza, al qual effetto si eccita la lodeuole attenzione delli respettiui N. N. H. H. Rappresentanti di applicarsi col maggior feruore, e resta espressamente incaricata la pontualità degli Uffiziali Direttori delli respettiui Appostamenti, e delle scorte per l'esatissima osseruanza della Terminazione sudetta.

14^to.

Qualora però alcun Suddito Ottomano tentasse, o gli riuscisse per auuentura d'introdursi, e penetrare nello Stato per altre uie furtiue, e clandestine fuorchè per la solita custodita, e uicendeuolmente accordata, dourà dalle Guardie al Confine, e se si sottraesse dalla loro osseruazione, dagli Uomini de Villaggi, non che da qualunque altro, in cui s'incontrasse, essere fermato, e fatto condurre dal Pubblico Rappresentante di quella Giurisdizione oue si trouasse con gli Animali, et effetti, sempre con li riguardi di Sanità alli Lazzaretti di Spalato, partecipandone sollecitamente la Carica per le ulteriori deliberazioni.

15^to.

Non ui sia alcuno de Sudditi, che si faccia lecito d'auuanzarsi al Confine all'incontro delle Carauane per contratti, o comprede, proibite queste particolarmente alla Bazzana di Sign, douendo tutte le Merci, e robbe prouenienti con le Carauane medesime essere ridotte, senza alcuna distrazzione, al Lazzaretto, sopra di che resta pur incaricato della maggior uigilanza il Direttore della Milizia, che s'attrouasse destinato in loro scorta.

Siamo persuasi, che cadauno de Sudditi uorrà uniformarsi intieramente alle premesse disposizioni, che tutte tendono all'interessante oggetto di presseruare la commune salute, ma se nonostante ui fosse alcuno cosi peruerso, che s'auuanzasse a trasgredirle, giustificata la colpa, l'accusatore, che comparisse a denonziarlo, oltre di essere tenuto secreto, riportarà il premio di dieci Ducati, da essergli esborsati dalla Cassa del Generalato.

Registrato il presente nell'Officio della Segretaria Nostra, e tradotto in Illirico, sarà accompagnato alli N. N. H. H. Rappresentanti delle Frontiere, Sopraintendenti, e douunque occorresse, per la sua publicazione, che dourà replicarsi ogni quindeci giorni, e diffondersi dalli Collonelli, e Capi de Territorj, ad uniuersale intelligenza per le Ville, e Posti anco della Linea, sichè conseguire quel frutto salutare, che dalla pontuale sua osseruanza saprà promettere particolarmente il zelo sempre attento delli stessi N. N. H. H. Rappresentanti. In quorum fidem etc.

Zara, primo Giugno 1763.

(Atti del Provv. Gen. Pietro Michiel, Libro I, Carte 39-42.)

NOTES.

1. — PIETRO MICHIEL fut gouverneur général de la Dalmatie et de l'Albanie pendant les années 1763 à 1765.
2. — *strepitosi apparati* : Il n'y avait pas de menaces de guerre en 1763. L'auteur pense sans doute ou à des préparatifs de guerres antérieures ou à des incidents de frontière fréquents entre les deux races.
3. — Serraglio = Sarajevo. D'après SCHNURRER : *Chronik der Seuchen*, 1825, II p.333., l'épidémie de peste commença en 1759 en Syrie, à Sidon et à Chypre. Voyez aussi STICKER : *Die Pest*, I, p. 250.
4. — *caravana* : Les caravanes allaient de Sarajevo en Dalmatie en passant par Livno, Sign et Clissa, mais il y avait aussi d'autres routes très fréquentées. On apportait à Spalato des marchandises qui devaient être exportées ou distribuées à Zara, Trieste et Venise.
5. — Dans les ordonnances (*Terminazione in materia di sanità per il contaggio svilluppatosi ne' Borghi di Spalato*) rendues le 12 janvier 1763 par PIETRO

MICHIEL et qui avec quelques autres déclarations postérieures constituent le *Règlement*, qu'on suivit pendant l'épidémie, il est constaté que la peste se montra le 19 décembre 1763 dans le faubourg Borgo Grande de Spalato. De là, la maladie se propagea aux autres faubourgs. Il est stipulé que les édits et ordonnances, antérieurement en vigueur et appliqués pour la dernière fois en 1731, conservent toujours force de loi. (*Atti del Prov. Gen. Pietro Michiel* 1763-1765, Libro I cc. 110-116). Du jour indiqué, on peut inférer que la maladie était répandue et reconnue parmi les habitants au moins deux mois avant que les autorités de la ville n'eussent consenti à y reconnaître la peste. En négligeant même ce que le Ms. dit pour Octobre et Novembre, on s'étonne, la peste étant constatée le 19 décembre, de voir tolérer une procession propitiatoire solennelle le 17 du même mois.

6. — La ville de Spalato est enfermée dans les murs du grand palais, bâti par DIOCLÉTIEN ; en dehors se trouvent les faubourgs : vers l'ouest Novi Grad et Borgo grande, vers l'est Lučac et vers le nord Manuš et Pozzobon.

7. — *toccano* : FRACASTORO fut le premier à soutenir, que l'infection peut être propagée par les objets et par le contact (*De contagionibus*). Dans le même livre il distingue des fièvres malignes la peste bubonique.

8. — GIOVANNI CARLO CASTELLI, neveu du médecin FRANCESCO CASTELLI. Le 16 mai 1762 il obtint la charge de médecin des lazarets avec la mission spéciale d'inspecter les caravanes et d'annoncer les cas de maladie qui se montreraient dans leurs rangs. (*Atti del Prov. Gen. Francesco Diedo*, 1760-62, Libro III cc. 176-177.) Il était en fonctions le 23 mai 1767, quand un certain Dr DANIELI devint son successeur « col riflesso non solo ai suoi requisiti, e cognizioni richieste, ma ancora al buon servigio, da esso prestato nell'ultime moleste insorgenze della Dalmazia ». (*Atti del Prov. Gen. Antonio Renier*, 1766-68, Libro I, c. 160.)

9. — SILOVICH, ANTONIO : Biographie inconnue. Dans une lettre du 15 octobre 1793 il est nommé chirurgien à Spalato. Il devint chirurgien à Narenta le 25 octobre 1793, comme successeur de SPIRIDION MEDIN, mort peu de temps avant (*Atti del Prov. Gen. Alvise Marin* 1793-95, Libro II, c. 35.)

10. — *Poissan* : Église de pèlerinage, près de la côte, à l'est de Spalato et au sud de la route d'Almissa.

11. — DELFINO (DOLFIN), ANTONIO : gouverneur de Spalato du 1 août 1762 au 22 avril 1765. Le grand mérite de DELFINO est, d'avoir, à un moment où les autorités n'avaient publié aucune ordonnance contre l'épidémie, tendu un cordon militaire tout le long de la frontière entre la Dalmatie et la Bosnie. Il assura aussi l'isolement des faubourgs à main armée, en même temps qu'il isolait les uns des autres. Il séquestra et barricada les maisons contaminées, ouvrit des hôpitaux et lazarets pour les malades, les suspects et les convalescents. Il organisa aussi des entrepôts de désinfection pour les objets, assigna des cimetières aux pestiférés. L'organisation de petites commissions sanitaires volantes, composées d'un préposé, de quelques deputés, d'un médecin et d'un chirurgien, est aussi due à son initiative. (Introduction à la *Terminazione de 12 janvier* 1763).

12. — MUZZUCATO : La charge de préposé militaire du district de Spalato et du territoire de Clissa étant vacante par la mort de GIROLAMO CAMBI, le cornette STEFFANO MAZZUCATO en fut pourvu le 11 juin 1763. Il appartenait à une famille originaire de Livno en Bosnie, c. à. d. du côté ottoman, mais qui en 1686 abandonna son patrimoine et s'expatria vers la république vénitienne après avoir obtenu du provéditeur CORNER le 1 septembre 1741 l'auto-

risation de partir en compagnie de nombreuses autres familles. Le chef de ces émigrants était FRANCESCO MAZZUCATO, qui aussitôt combattit les Turcs et montra un grand courage pendant le siège de la ville de Sign. Les frères NICOLÒ et GIACOMO MAZZUCATO se distinguèrent également à la prise de Knin, Castelnuovo et Narenta. En essayant d'étendre les frontières, GIACOMO mourut à la bataille de Livno, dans laquelle il massacra un grand nombre de Turcs, entre autre le sciliftar du pascha bosnien, duquel il coupa la tête. C'est alors à NICOLO que revint l'honneur de diriger l'assaut de Knin. A la tête de ses soldats, il traversa à la nage la rivière Kerka, monta le premier à l'assaut de l'ancien chef-lieu et y planta le drapeau. Il se rua sur les portes de la ville, les enfonça pour donner à ses troupes l'accès de la place. Il obtint pour toute récompense le droit de garder le drapeau de l'assaut, qu'on se transmit de père en fils dans sa famille, établie à Spalato en compagnie des autres familles bosniaques. Dès lors STEFFANO MAZZUCATO devint le chef de la famille et son guide. Le père de STEFFANO, PIETRO MAZZUCATO s'était aussi distingué; il réorganisa le commerce avec la Turquie, et fit livrer sans frais par les Turcs, à Sign une multitude de poutres pour la république vénitienne. Une pareille livraison était de grande valeur, car depuis le moyen-âge la Dalmatie était déboisée.

STEFFANO MAZZUCATO était colonel et préposé des forts et district de Spalato, du territoire Clissa et des îles adjacentes. Son traitement était de 25 ducats (*Patente al colonello Sopraintendente Steffano Mazzucato, datée le 1 août 1763 à Spalato. Atti del Prov. Gen. Pietro Michiel* 1763-65, Libro I, cc. 61-62). Dans une lettre du doge ALOYSIUS MOCENIGO, datée die decima nona Januarii. Inditione duodecima MDCCL XIII les 25 ducats furent remplacés par 36 Lire (*Atti del Prov. Gen. Pietro Michiel*, 1763-65, Libro I, cc. 121-22).

Dans une autre lettre du provéditeur général FRANCESCO FALIER, datée die III Marti, Ind. III MDCCL XXXV STEFFANO MAZZUCATO est nommé colonel à Sign à cause de ses bons services pendant la peste (*Atti del Prov. Gen. Francesco Falier*, I, 1, 10.) La poste de Spalato fut donné au comte SIMON BENEDETTI, qui s'était distingué pendant la peste à Clissa, sur la recommandation des brigadiers RADO et MONARI. (*Atti del Prov. Gen. Francesco Falier*, 1784-86, Libro II, carte 145).

13. — *Castelli di San Stefano e Capogrosso* : Un château de Saint Étienne ne semble pas avoir existé, et on n'a pu le retrouver sur les plus anciens plans de la ville. De nos jours Castello di San Stefano est le cimetière de la ville, fondé en 1821 sur un terrain occupé depuis le IX^e^ siècle par un monastère des Bénédictins. Castel Capogrosso est un château de la famille Capogrosso à l'ouest de S. Stefano. Ces lazarets furent surveillés par les deputés sanitaires de concert avec un chirurgien. (Comparez le § 4 des *Obblighi dei Deputati, Medici, Chirurghi ed altri* (appendice p. 5). Le lazaret de Capogrosso était destiné aux suspects, conformément aux propositions de NICOLAO MASSA qui fut des premiers à proposer des mesures prophylactiques d'État contre la peste, mesures adoptées par le Sénat vénitien. Elles comportaient l'érection de deux hôpitaux dans une ville contaminée, l'un pour les malades, l'autre pour les suspects, surtout ceux ayant communiqué avec les malades ou appartenant à leur famille.

14. — *Lazzaretti* : Le lazaret existe encore, transformé en prison. Il est situé dans la rue Put Tamnica, hors les murs du palais de Dioclétien et près de la tour de Sud-Est du palais de Dioclétien. La prison montre encore une

chapelle de St Roch, et les grandes cours de l'ancien lazaret, les constructions étant demeurées à peu près telles qu'autrefois.

15. — L'activité de DOLFIN comme organisateur de la bienfaisance et des secours aux indigents est attestée au § 5 de *Obblighi dei Deputati, Medici, Chirurghi et Altri* (Appendice p. 6).

16. — *Botticelle* : Langue de terre qui termine le port de Spalato vers l'Est. Allusion au fait que ce port a la forme d'une bouteille de vin, dont le goulot est placé entre Botticelle et St. Stefano.

17. — *Paludi* : Le couvent de Santa Maria dei Paludi est situé au Nord-Ouest de Spalato près du fond du canal castelli.

18. — Voyez le § 1 de la Terminazione de 12 janvier 1763. (*Atti del Prov. Gen. Pietro Michiel*, Libro I, cc. 110-116; Appendice p. 7).

19. — RADO, PIETRO : Dates biographiques inconnues. L'ordonnance du 12 janvier 1763 le nomme surintendant (sopraintendento) en même temps que le MAZZUCATO déjà cité.

20. — PINELLI : PAOLO PINELLI, dont les dates de naissance et de mort restent inconnues. Il fut nommé préposé sanitaire (physicus) temporaire à Traù le 19 aout 1741 par le provéditeur général MARIN ANTONIO CAVALLI (*Atti del Prov. Gen. Marin Antonio Cavalli*, 1738-41, Libro I, c. 261-262), il était donc le successeur de PIETRO PINELLI, nommé le 16 avril 1716 par le provéditeur général ANGELO EMO (*Atti del Prov. Gen. Angelo Emo*, 1714-17, Libro III, cc. 213). PAOLO était fils d'ORAZIO PINELLI (n. 1694, m. vers la fin d'avril 1764), protomédecin de la Dalmatie pendant plus de 30 années, et qui s'était fait remarquer pendant la peste de 1731-32 à Castel Abbadessa et dans les faubourgs de Spalato. Comme il était alors plus que septuagénaire, le Doge lui permit par une lettre du 21 avril 1764 de prendre, sans frais ou dépenses publiques, son fils PAOLO comme assistant; mais il mourut avant que cet arrangement entrât en vigueur. PAOLO lui succèda dès lors dans ses charges (*Lettre de Zara*, le 1 septembre 1764. *Atti del Prov. Gen. P. Michiel* 1763-65, Libro I, c. 166), qu'il conserva pendant vingt-deux années. PAOLO, lui aussi, devint à peu près septuagénaire, et fut également forcé de demander aide pour remplir ses engagements, qui comprenaient en outre le service sanitaire des hôpitaux militaires et marins. Son fils ORAZIO, qui avait longtemps pratiqué à Zara et acompagné son père pendant ses tournées de service en Bosnie, devint son aide (*Atti del Prov. Gen. Francesco Falier*, 1784-86, Libro II, c. 314-15). Une lettre du Doge, datée du 31 mars 1787 lui ordonna d'entrer dans la charge paternelle après la mort de PAOLO (*Atti del Prov. Gen. Anzolo Memo*, IV, 1787-89, Libro III, c. 115.). Le 2 janvier 1791 on augmenta le salaire de PAOLO PINELLI de 8 ou 9 sequins en considération de ce qu'il avait exercé la même charge pendant plus de vingt-neuf ans, que cette charge était restée dans sa famille pendant plus de 60 ans, qu'il s'était rendu en Bosnie à diverses réprises, et qu'il avait combattu deux fois les épidémies, sans compter les épizooties. (*Atti del Prov. Gen. Alvise Marin*, 1793-95, Libro II, cc. 27-28.)

21. — SAJANO : Les archives de l'État à Zara ne possèdent aucun renseignement sur ce médecin.

22. — ZICCAVO (CICAVO), GIOVANNI CARLO PAGANELLI, dont les dates biographiques sont inconnues, fut nommé le 12 décembre 1766 gouverneur de Zara par le doge ALOYSIUS MOCENIGO. La nomination est enregistrée le 30 mai 1767 dans les *Atti del Prov. Gen. Antonio Renier* 1766-1768, Libro I, c. 110. On le fit passer plus tard à Cattaro, où il est qualifié en 1769 de sergent

major de bataille (*Atti del Prov. Gen. Domenico Condulmer* 1769-1771 dans les *Dispacci al Serenissimo Principe di Venezia*, Libro I, carte 96).

23. — *Pozzobono* : cf. la note nº 6. Les grandes routes de la Bosnie passent par les faubourgs du Nord, Pozzobon et Manuš, de Spalato.

24. — *marcato* : Dans la législation d'État, ou communale, la précaution de marquer les maisons pendant les épidémies de peste apparait d'abord en France vers 1500, plus tard en Italie et ailleurs. On lit dans les « Ordonnances faictes et publiées à son de trompe par les carrefours de ceste ville de Paris » (1531) qu'on employait une croix de bois : » Quilz aient a mectre ou faire mectre ès fenestres des-dictes maisons ou aultre lieu plus apparent vne Croix de boys. Et au milleu de la principalle porte, huys, et entrée du dict hostel vne autre Croix de boys clouee et fichee contre les dictes portes et huys. A ce que chascun en puisse avoir congnoissance et soy abstenir y entrer ». (CHÉREAU, p. 116). A Spalato cette mesure fut prescrite par le § 2 des *Obblighi dei Deputati, Medici, Chirurghi ed altri* (Appendice p. 5). — Il ne faut pas confondre cette précaution avec la coutume, bien connue en Italie, de peindre des caractères ou lettres de conjuration sur les murs des maisons pour écarter la contagion. (STICKER *l. c.* p. 410 et ANDRÉE-EYSN : *Volkskundliches aus dem bayrisch-oesterreichischen Alpengebiet*, Braunschweig, 1910 qui contient l'article *Das Tau und die Pestamulette* p. 63-72.

25. — *Magazzino* : L'endroit où ce magasin était situé demeure inconnu; le texte ultérieur du manuscrit montre que ce magasin était le lieu de distribution des objets à désinfecter provenant de Capogrosso, San Stefano et Lučaz. Cavana est, en langue Croate, un café. Monseigneur BULIČ m'informe que le mot *cavana* peut être une erreur de manuscrit. Il faudrait sans doute lire *canava* (*canova*), mot italien qui désigne un cave pour le vin (cantina). Dans ce cas une telle cave, d'assez grandes dimensions, aurait été employée pendant la peste, comme lieu de désinfection et de distribution; elle était sise dans la grande rue du faubourg de Lučac, menant à l'église déjà mentionnée de Poissan.

26. — 40 *giorni* : Le conseil municipal de Raguse avait — le tout premier — par décret du 27 juillet 1377 prescrit une quarantaine d'un mois, c. à. d. 30 jours, à tous les étrangers, qui désiraient entrer en ville et qui venaient des lieux contaminés par la peste. Ce laps de temps se montra insuffisant et fut augmenté de dix jours, quand la première station de quarantaine fut installée à Marseille en 1383. Plus tard on fixa une période fixe de quarante jours. Il est étonnant que la *Terminazione* de 12 janvier 1763 ne fixe pas la durée de la quarantaine et même en traite largement les modalités. Les 40 jours ne furent précisés que deux jours plus tard par l'ordonnance de 14 janvier 1763.

On décréta aussi dans la première ordonnance que la ville devait être divisée en quartiers, sans spécifier combien. Sans doute y en avait-il six, sinon plus, car ce nombre est attesté dans la codification des règles sanitaires, due au provéditeur général FRANCESCO FALIER pendant la peste de 1784, c. à. d. seulement vingt ans après l'épidémie dont nous traitons ici. Dans chaque quartier on désigna un chef (*capo di contrada*) pour visiter en compagnie du chirurgien et de la garde, les maisons séquestrées (*Obblighi* § 1.) Il était formellement interdit aux occupants de quitter leur maison; seuls les pères de famille et un domestique pouvaient sortir, garantis par un laissez-passer, pour se procurer des denrées alimentaires. On sonnait les cloches de l'église pour avertir du commencement et de la fin de l'inspection. (*Ordonnance* de 14 janvier 1763 et *Terminazione* de 12 janvier 1763).

27. — *Salona* : Dans l'antiquité, Salona était la ville la plus importante de la Dalmatie. Quand les Goths en 535 et les Avares en 614 l'eurent détruite, les habitants cherchèrent abri derrière les murs du palais de DIOCLÉTIEN à Spalato et y restèrent. De nos jours la ville de Salona est bâtie sur les ruines de la ville antique. Le fleuve Jader a son embouchure dans le Sinus salonitanus (canale castelli), au Sud de la ville, qui toujours est célèbre par ses moulins. BRÜNNICH, qui visita Salona en compagnie de GIULIO BAJAMONTI, alors jeune homme, donne une esquisse de la région et parle amplement de la construction des moulins. (voyez planche B).

28. — ARNERICH, GIOVANNI (ZUANNE). Les dates suivantes sont tirées des lettres patentes émises le 3 mai 1760, nommant ZUANNE ARNERICH capitaine du régiment Macedonia (*Atti del Prov. Gen. Francesco Diedo*, 1760-62, Libro II, cc. 87). Son père était le capitaine GIROLAMO ARNERICH, qui sacrifia sa vie pour la défense de Torre di Norino pendant les guerres avec la Turquie. Son père PIETRO lui succéda comme chef de compagnie; quand il mourut pendant la guerre, ZUANNE le remplaça, et après en avoir la charge temporairement il devint porte-enseigne jusqu'en 1741; il était en même temps adjudant de régiment. Il se fit remarquer pendant les épidémies antérieures en Dalmatie, en Frioul et à Polesene et fit un bon service dans les districts côtiers et dans la forteresse de Palma, pendant le voyage de la reine de Naples, MARIE AMÉLIE. Puis il fut envoyé dans le Levant, à Preveza et à Voniza, où il s'engagea dans l'armée formée contre les Turcs, qui s'étaient avancés pour détruire les habitations de la plaine de Voniza. Il avait aussi rendu de signalés services dans la marine. (*Atti del Prov. Gen. Francesco Diedo*, 1760-62, Libro II, cc. 91-92 et III cc. 135.)

ZUANNE ARNERICH fut nommé le 23 août 1765 gouverneur de Sebenico. Il existe encore d'autres lettres patentes concernant sa nomination au grade de colonel, datées de Cattaro, le 20 septembre 1770 (*Atti del Prov. Gen. Domenico Condulmer*, 1769-71, Libro II, cc. 81.) On y voit qu'il était entré dans l'armée dès son jeune âge; en 1716 il suivit comme chef de compagnie le corps auxiliaire envoyé au secours de la forteresse de Strumizza. Il détint cette charge jusqu'en 1731, et devint alors sergent major. Plus tard, en 1768, il fut nommé lieutenant-colonel au régiment d'outremer du colonel PIETRO RADO. Ces patentes attestent ses bons services comme directeur des cordons militaires pendant la peste. Il reconduisit dans la république vénitienne beaucoup de familles de l'autre côté de la frontière, leur distribua du bois et des marchandises. Chargé du recrutement en temps difficiles, et directeur de la force militaire, ARNERICH fut, en dernier lieu, nommé gouverneur de Knin le 25 mai 1782 (*Atti del Prov. Gen. Francesco Falier*, 1784-86, Libro I, c. 60.)

29. — Au commencement de l'épidémie les foires, marchés et toutes réunions furent interdites. La *Terminazione*, § 4, renouvelle ces défenses, surtout quant aux enterrements. Ces prohibitions furent maintes fois réitérées jusqu'à la fin de l'épidémie. Le service divin n'est pas spécialement mentionné, mais le § 5 exhorte les prêtres à donner leur soins et à distribuer les sacrements avec les précautions d'usage. Un décret de clôture des églises fut certainement lancé, car cette prescription fut déclarée maintenue pendant la peste de 1784.

Les règlements de cette épidémie disent au § 13 : *Resta confirmata la deliberazione delle Spettabile Collegetto per la chiusura di tutte le chièse di questa Città, onde non abbiano a verifficarsi radunanze, le quali douranno egual-*

mente intendersi inibite in qualsivoglia altro luoco. (Le règlement de FRANCESCO FALIER du 3 avril 1784 dans les *Lettere al Magistrato sopra la Sanità di Venezia dell Sign. Paolo Boldù*, Prov. Gen. in Dalmatia et Albania. L'anno 1783, scritte dal Dott. GREGORIO STRATICO I.)

30. — Les phrases : *Si provvide ancora ai modi necessarii per condurre* × *accio mai tramandasse il mal odore della pestilenza* se trouvent sous la même forme dans la *Relazione del Proveditor Pietro Michiel al Senato sul morbo contagioso in Dalmazia l'anno* 1764, manuscrit de vingt feuilles autrefois dans les Archives de Zagreb. Cette partie est citée dans le livre de FR. BULIČ : *Dva Sarkofaga Ivana Ravenjanina i Lovre Dalmatinca Spljetskih nadbiskupa* — Zadar 1882. (Deux sarcophages de JEAN DE RAVENNE et de LAURENT LE DALMATE, archévèques de Spalato). — D'après une lettre du directeur le manuscrit en question n'existe plus dans les Archives à Zagreb.

Le décret sur les inhumations dans la chaux vive forme le § 3 des *Obblighi* (Appendice p. 5).

31. — *Bestie* : Le § 8 de la *Terminazione* dit que les chiens et les chats errants seront tués en raison des possibilités de contagion. Les inspecteurs sanitaires et deputés devaient veiller au massacre de ces animaux, mais le règlement est muet sur le sort de leurs cadavres. Comme personne n'osait y toucher, ils restaient à l'état de charognes dans les chemins et les ruelles.

32. — *Fuochi* : Voyez *Regole per l'espurgo delle cose infette* § 2 (appendice p. 9). La désinfection par le feu était faite par des parfumeurs (*profumatori*) portant des torches de genièvre et de romarin. Avec celles-ci on flambait les murs, plafonds et coins.

33. — Le § 2 de la *Terminazione* dit que quiconque se sentira malade en devra immédiatement aviser le deputé afin qu'on puisse prendre de suite les précautions nécessaires. Cette ordonnance concernait autant les pestiférés que les malades d'autres catégories. La peine de mort était portée contre qui célerait les cas; on suivit ainsi les régles employés à Majorque en 1714 et adoptées par la république vénitienne, qui en 1504 avait conféré au Conseil de Santé le droit de vie et de mort pour toutes infractions aux règlements contre la peste. (STICKER II, p. 297.)

34. — *Nota* : voyez *Obblighi* § 1.

35. — *Caselli di tavola* : Des hangars, cabanes ou seulement abris provisoires sont signalés dans plusieurs épidémies italiennes de peste, employés concurremment avec les lazarets, une fois complets.

36. — *Tuellio, Giorgio* : Biographie inconnue; il appartient à une ancienne famille noble de Spalato.

37. — Les inspecteurs des lignes devaient parer aux vols. Leur ordre était d'arrêter les larrons ou de tirer sur eux, s'ils prenaient la fuite (*Terminazione* § 11).

38. — *Bastaggi* = Bastasi (du grec *Βαστάζω*) = portatori, facchini : Les portefaix étaient de deux sortes, nets et impurs. Les premiers recevaient les objets des maisons contaminées et les portaient aux locaux de désinfection, où ils étaient reçus par les nets. Le curé ou quelque autre ecclésiastique devait enregistrer les objets, inventorier les effets des familles et les marquer afin de les rendre plus tard aux possesseurs (*Metodo per gl'espurghi* § 8 et 9; appendice p. 8).

39. — *Sta Croce* est le même faubourg que Borgo grande; il prend son nom de l'église paroissiale de Ste Croix.

40. — PETROVICH, PIETRO : Dates de naissance et de mort inconnues, mais on peut inférer de divers documents des Archives de Zara, que sa famille s'était

fait remarquer pendant les guerres de Candie, en Dalmatie, au Levant, aux Dardanelles, pendant l'expédition contre Elgena, à la conquête de Volo et pendant le siège de Malvasia. En particulier le capitaine de cavalerie DOMENICO PETROVICH et le colonel FERDINANDO PETROVICH avaient montré un courage peu ordinaire. Ce dernier avait assisté à l'assaut de six villes diverses, participé à la bataille d'Argos et dans huit combats navals reçu maints horions sérieux, dont le pire fut une fracture de la jambe droite, survenue à l'assaut de la brèche de Negroponte. Les frères GASPARO et PIETRO PETROVICH, capitaines, se firent également remarquer. Le dernier fut fait prisonnier à Modon, devint esclave et finit sa vie dans les bagnes turcs; son frère reçut une arquebusade ennemie à la défense de Corfou.

PIETRO PETROVICH, mentionné ici, entra à l'armée comme porte-enseigne (alfiere), devint plus tard lieutenant, ajudant de régiment et de brigade, capitaine-lieutenant et fut le 17 juillet 1760 nommé sergent-major de régiment. Sa nomination fut approuvée par une lettre de doge de 23 décembre 1760; sa nomination de capitaine suivit le 26 mars 1761. (Lettres du 30 janvier 1761 dans *Atti del Prov. Gen. Francesco Diedo*, 1760-62, Libro III, cc. 138-139, et du 15 avril 1761, ibidem, cc. 72-73, toutes deux de Zara.) Il fut nommé gouverneur militaire de Spalato le 17 juin 1765 (*Atti del Prov. Gen. Pietro Michiel*, 1763-65, Libro I, c. 226) à la mort de son prédécesseur le colonel, comte PIETRO GELLICH. Enfin, il fut gouverneur militaire de Cattaro le 3 mars 1774. (*Atti del Prov. Gen. Giacomo Gradenigo*, 1775-78, Libro II, cc. 24.)

41. — *Il metodo* : Ce que le manuscrit dit de la désinfection des maisons, chambres et objets concorde avec les décrets des *Regole per l'espurgo delle cose infette* (appendice p. 9). Il suit les préceptes de désinfection que GIAN GALEAZZO VISCONTI avait proposés en 1399. (voyez CORRADI: ANNALI, I p. 246.)

42. — 80 *giorni* : Total de la quarantaine impure et nette. Divers documents donnent des renseignements sur la fin de l'épidémie. Une ordonnance de Spalato du 1 juin 1764 dit qu'aucun nouveau cas ne s'était montré pendant les deux derniers mois; le dernier cas s'étant manifesté dans la maison BLASEVICH à Borgo Grande. (*Atti del Prov. Gen. Pietro Michiel*, Libro I, c. 144-145). Un décret de Spalato du 4 août 1764 réduit la quarantaine des soldats territoriaux à 21 jours pour la ville de Spalato (*l. c.*; c. 159); un autre édit, daté de Zara, le 3 septembre 1764, réduit la quarantaine à Spalato à sept jours seulement. Les faubourgs de la ville sont en même temps mis en libre communication avec les districts voisinants, avec Traù, le littoral, le district des montagnes et Clissa; mais en cette dernière localité la quarantaine devait encore durer quatorze jours.

43. — *Doimovaz* = Dujmovača; St. Doimo, position et chapelle au Sud de Salona, près du fond de Vranjička Luka. Stobreč, l'*Epetium* des Romains, est située à 6 klm à l'Est de Spalato sur la mer. La ligne de séquestration était alors tracée de manière à exclure toute la peninsule, sur laquelle Spalato est située.

44. — PADOVEN, personnage inconnu.

45. — FLOSBERGH, personnage inconnu.

46. — *Ham*. Dans les lettres de PAOLO BOLDÙ, écrites par STRATICO, cette localité est appelée *Han*; c'était exactement là qu'on construisit le camp en 1784.

47. — CONTARINI, SIMONE, né à Venise le 27 août 1563, mort le 10 janvier 1633. Il étudia à Padoue, fit un voyage à Rome, et fut ambassadeur à Turin, en Espagne, à Constantinople auprès du sultan MAHMOUD III, et en France. De retour à Venise il devint procurateur.

48. — *Panduri* : Les morlacs formaient — sous le nom de Pandours — un corps de milice rurale, qui fut employé à la surveillance des postes militaires. Ce corps était installé dans les forts de la frontière, et les pandours servirent d'officiers aux soldats de la milice nationale, qu'ils avaient sous leurs ordres. Ils étaient réputés comme peu dignes de confiance; on les soupçonnait de prêter la main à toutes sortes de concussions. (BAJAMONTI : *Storia della peste* p. 17.)

49. — *ultima pace* : La Dalmatie vénitienne était divisée en trois parties, 1. les domaines anciens, qui comprenaient toutes les îles et villes du littoral acquises par voie pacifique, et aussi Scardona, conquise sur les Turcs. Cette partie de la province allait alors de Zara, Novigrad, Salona, Clissa à Spalato. 2. Le domaine nouveau, conquis *manu militari*, était constitué, d'après la convention de paix de Karlowicz (1699) par une partie du district de Zara, Sebenico et Traù, les districts de Knin et Dernisch et diverses parties des districts de Scardona, Spalato, Sign, Almissa, Macarsca et Narenta. La ligne de démarcation de ce domaine est connue sous le nom de « Linea Mocenigo ». 3. Les acquisitions les plus récentes, consenties aux Vénitiens après la paix de Passarowitz (1718) furent constituées par une partie du district du Sud de Knin et de Sign, une partie du district d'Almissa, Macarsca et Immoschi.

BIBLIOGRAPHIE.

Sources manuscrites.

Copenhague. Bibliothèque universitaire.

Brünnich, M. J. Noget om mit Levnetslöb ind til den mig saare ubehagelige Reise og tiltraadte Embede i Kongsberg (M.s. *Fondation Brünnich* N° 39, 4^to.)

Brünnich, M. J. Noget om mit Levnets Löb fra Aar 1737 til 1769 (M.s. *Fondation Brünnich* N° 40, 4^to.)

Zara. Archives de l'Etat.

Atti del Proveditor Generalis ANGELO EMO (1714-17).
» » » » MARIN ANTONIO CAVALLI (1738-41).
» » » » FRANCESCO DIEDO (1760-62).
» » » » PIETRO MICHIEL (1763-65).
» » » » ANTONIO RENIER (1766-68).
» » » » DOMENICO CONDULMER (1769-71).
» » » » GIACOMO GRADENIGO (1775-78).
» » » » FRANCESCO FALIER (1784-86).
» » » » ANZOLO MEMO (1787-89).
» » » » ALVISE MARIN (1793-95).

Lettere al Magistrato sopra la Sanità di Venezia dell'Signor PAOLO BOLDÙ, Prov. Gen. in Dalmatia et Albania. L'anno 1783 scritte dal Dottore GREGORIO STRATICO.

Raguse. Archives de l'Etat.

Lettere e Commissioni di Ponente Lib. 77, 1763.

Sources imprimées.

ANDRÉE-EYSN, MARIE : Das Tau und die Pestamulette (Volkskundliches aus dem bayrisch-österreichischen Alpengebiet.) Braunschweig 1910.

Ansteckende Seuche, welches dieses 1713 Jahr in das Ertz-Herzogthum Nieder-Oesterreich eingeschlichen.

BAJAMONTI, G : Storia della peste, che regnò in Dalmazia negli anni 1783-84. Venezia MDCCLxxxvi.

BOREL, FRÉDÉRIC : Choléra et Peste dans le pèlerinage musulman 1860-93. Paris 1904.

BULIČ, FR. : Dva Sarkofaga Jvana Ravenjanina i Lovre Dalmatinca Spljetskih nadbiskupa. Zadar 1882.

CHENOT, Adamus : Tractatus de Peste. Vindobonae MDCCL xvi.

CHEREAU, ACHILLE : Les ordonnances faictes et publiées à son de trompe par les carrefours de ceste Ville de Paris. Paris 1873.

CORRADI, A : Annali delle epidemie occorse in Italia Bologna 1865.

FRARI, A. A. : Della peste et della publica amministrazione sanitaria. Venezia 1840. I (le tome II n'a jamais paru.)

GOBBI, FERDINAND : Beiträge zur Entwicklung und Reform des Quarantainewesens. Wien 1849.

GOMES, A : Relatorio sobre os trabalhos da conferencia sanitaria internacional, reunida em Constantinopola em 1866. Lisboa 1867.

HAESER, H. : Geschichte der epidemischen Krankheiten. Jena 1865.

HIRSCH, A. und SOMMERBRODT, M.: Mitteilungen über die Pestepidemie im Winter 1878 bis 1879 im russischen Gouvernement Astrachan. Berlin 1880.

HOWARD, JOHN : An account of the principal Lazarettos in Europe, with various papers relative to the plague, together with some further observations on some foreign prisons and hospitals. Warrington MDCCLxxxix.

MURATORI, L. A. : Scriptores rerum Italicarum, tome XII.

Del Governo della Peste e della maniera di guardasene. Modena 1714.

NYERUP, RASMUS : MORTEN FHRANE BRÜNNICH, Naturvidenskabens Senior i Danmark.

Oesterreichisch-ungarische Monarchie, Die. Bd. VII. Dalmatien. Wien 1892.

PETTER, F. : Dalmatien, I-II, Gotha 1857.

PRUS : Rapport à l'Académie Royale de Médecine sur la peste et les quarantaines, fait au nom d'une commission. Paris 1846.

Rapport sur les questions du programme relative à l'origine, l'endémicité, à la transmissibilité et à la propagation du choléra. Conférence sanitaire internationale. Mai 1866. Constantinople 1866.

Rapport sur les mesures à prendre en Orient pour prévenir de nouvelles

invasions du choléra. Conférence sanit. internat. Constantinople 1866.
SCHRAUD, FRANZ, EDLER VON : Vorschriften der inländischen Polizey gegen die Pest und das gelbe Fieber. Wien 1805.
SCHNURRER, FRIEDRICH : Chronik der Seuchen. Tübingen 1823-25.
SCHRÖTTERINGK : Gedanken über Quarantaine-Anstalten. 1789.
SOMMERBRODT, M., voyez HIRSCH, A.
STICKER, G. : Die Pest I-II. Giessen 1910.
Traité des causes, des accidents et de la cure de la Peste avec un receuil d'observations, fait et imprimé par ordre du Roi. Paris MDCCXLIV.
Untersuchung über die Pest. Prager Vierteljahrschrift für Heilkunde, 1847. II.
WEISZBRODT, JOHANN BAPTIST VON : Denkschrift über die orientalische Pest in sanitätspolizeylicher Beziehung. München 1853.

Wave-like Fluctuations of Creative Productivity in the Development of West-European Physics in the Eighteenth and Nineteenth Centuries *.

There is no doubt that creative productivity in any of the scientific fields, measured by the mass of corresponding scientific discoveries, fluctuates in different periods of the development of the given science. Of course, in general the absolute quantity of creative productivity, in correspondence with the general development of culture, at least in the last centuries, reveals a process of growth as time goes on. But the tempo of this growth does not remain uniform. The changes of this tempo, related to the basic tendency of the growth of creative productivity, thus constitute the wave-like fluctuations of the latter.

The existence of such more or less long waves in the tempo of the growth and in general changes of creative productivity in science may be foreseen, first at all, on the basis of certain general theoretical considerations.

In his recent mathematical work, devoted to the question of the origin of so-called quasi-periodic fluctuations by means of the addition of accidental causes, Professor E. E. SLUTZKY showed, among other things, the following (1).

Let us consider any empirically given series of values, the significances of which are, in each case, the results of « accidental » causes. And let us assume that, thanks to some temporary combination of these causes, between neighboring members of

(*) The calculations were made by O. V. GORDON and M. L. KOURASHEVA with the assistance of N. S. CHETVERIKOFF.

(1) E. SLUTSKY. a) The Summation of Randome Causes as the Source of Cyclic Processes (Problems of Economic Conditions, 3, 1 Moscow, 1927 (Russ. with English summary). b) Sur un théorème limite relatif des quantités éventuelles (*Comptes Rendus*, t. 185, p. 169, 1927).

our series of consequences there exists a correlative connection, consisting, as is known, in the fact that the significance of each of the members depends upon the significance of others — upon the nearer members in greater degree than upon the more distant. E. E. SLUTZKY revealed that such series of correlatively connected consequences of accidental causes, developing, give a wave-like distribution of values. For example, in the beginning they gradually grow, then, just as gradually, they begin to decline, in order again to experience a more or less even increase, etc. and this notwithstanding the fact that the series on the whole may have any general tendency, permeating all its component parts and compelling the series to change in some definite direction.

These general considerations may easily be applied to the question under consideration. The yearly numbers of scientific discoveries, made in individual countries in any field of knowledge and measuring by their mass the exertion of creative activity in this field, really constitute a series of results, arising from the addition of accidental causes. Individual discoveries, as a rule, are the result of the activity o scientists, more or less independent of each other in their work and *n this sense* representing accidental factors of the discoveries. Ho ever these scientists are not altogether independent of each other. The interests which inspire some at a given time always in greater or less degree and for more or less long periods are shared with others. And hence the number of discoveries which they make from year to year also stand in a certain correlative relation one to another, the number of discoveries now grows from year to year, now more or less gradually diminishes, and these fluctuations may often take place about a rising line of growth of the general mass of discoveries, then representing variations in the tempo of this growth.

In the field which interests us here, in the field of history of physics, such wave-like fluctuations of the tempo of the growth of the number of discoveries are presupposed not only *a priori*, but are also as a result of empirical investigation. And, of course, inasmuch as these waverings may lay claim to historical reality, i.e. may be affixed to definite dates in time and in geographical space, their empirical establishment necessarily should play a firstclass, decisive role.

In the literature on the history of natural science, and especially of physics it has really already been pointed out that the creative activity of this or that country does not remain constant in time. For example, F. KLEIN (2) emphasized the long known fact that the end of the eighteenth century and the first decades of the nineteenth in France were a time of highest flourishing of physical-mathematical sciences. About 1830, according to his observation, this enlivenment was replaced by a relative decline. Here we have an indication of quite a long wave of creative activity. Also in France, according to the observation of FABRY (3), occurred another, similar wave. He noted, for instance, that the period of the Second Empire (1851-1870) in France was unfavorable for the development of such a leading sphere of physical science as thermodynamics. And only with the passing of this period began a more lively development of physical science in this sphere.

These and some other similar observations permit one to think that historical investigation could trace the fluctuations of creative productivity, at least in the sphere of physics. But since they possess the character of notes made en passant such observations, by themselves, cannot be recognized as sufficient for the actual establishment of the corresponding facts. And this all the more because it is a question of facts, mostly, of a quantitative nature. Affirming that the tempo of growth of creative activity in a given country and field of science experiences fluctuations in point of time we express a judgment about the fluctuations of a certain value. In order that such a judgment should possess sufficient definiteness it would be necessary to have the possibility somehow to measure this value and its variation. Up to this time this as it seems was not done in a sufficiently systematic form. And the very aim of the author of the present sketch was to obtain a quantitative measurement of the tempo of change of the number of discoveries in physics of modern times, in order in this way to ascertain the existence or non-existence of the above mentioned fluctuations of this tempo.

The method of investigation in this connection was self-in-

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(2) F. KLEIN. Vorlesungen über die Entwicklung der Mathematik im 19. Jahrhundert, I, 1926, SS. 63 ff., 87-88.

(3) Ch. FABRY. Histoire de la Physique (Histoire de la nation Française, dirigée par HANOTAUX, t. 14, 1924, p. 329.

dicated. It was necessary to give statistical expression to the mass of discoveries, made in physics from year to year, and then to subject the time series, which were to be obtained in this way, to a working over which might reveal the special qualities of these series.

However, all this presupposes that in general the problem of counting the number of discoveries in any fragment of time has a sense. But this is open to question.

The point is that a scientific discovery is something « ideal » — every discovery represents an idea of some content. « Ideas » in general do not possess a ***material*** existence. It is impermissible to ascribe the latter to them indirectly, either relating the scientific idea to that printed or other material cover, in the form of which the idea is published. It is impermissible — because, as could be demonstrated, several ideas can correspond to one and the same publication — and ***vice versa***. We must here accept this thought without proofs. So we must count ideas, as such, ***in all their immateriality***. Is this possible? We considered ourselves justified in replying to this question in the affirmative.

To count up any sort of class (aggregate, set) means to establish a correspondence between its indivual members and those of the class of all the natural numbers. To establish such a correspondence it is indispensable that

1. The members of the counted class (aggregate, set), should possess features making it permissible to refer them ***really*** to this class.

2. The members of the counted class should be so definite that every one of them may be clearly distinguished from every other member of the same class.

Apparently the class (aggregate, set) of scientific discoveries, made anywhere at a given time satisfies both these elementary conditions. And, consequently, to each one of them it is possible to refer some one, and only one of the class of natural numbers, i.e. to assign a numero to every discovery. And this means to reckon up the number of discoveries.

In this connection we must not be confused by the fact that, reckoning up the number of discoveries, we take each discovery for a unit, whereas in reality discoveries are not of equal value. This cannot obstruct the reckoning because, ***for the purpose of***

accounting, all discoveries are equally valuable — we are interested in them *only* because they are all *equally* discoveries and further because they are *different* discoveries. Similarly we count the population of any country, taking for the unit each of its inhabitants, regardless of differences of sex, age, social position, etc.

The question arises, what is the scientific value of such an account of the general mass of discoveries, without regard for the *different significance* of separate discoveries. Might it not turn out that two epochs, characterized, let us assume, by approximately the same number of discoveries in some unit of time, will differ very much according to the scientific *weight* of what was achieved in each of them?

This, of course, is possible, even though it has not been proved with sufficient strictness.

But let us grant that such proof can be and will be presented. Nevertheless this would not make superfluous the method of reckoning the general mass of discoveries which we propose. Its significance is comparable with the significance of a general account of the population in the economic and social life of some country. Of course it is desirable to differentiate our knowledge about it, dividing it into groups according to nationality, sex, age, class, property, etc., and demographic statistics are more or less successfully occupied with this. However, this does not make unnecessary a definition of the general mass of the population, i.e. the knowledge of how many human units enter into its make - up in one or another period. This is important not only because any demographic grouping already presupposes a knowledge of the general number of the population, but also because the number of the population is a factor which plays an independent role in the economic and general social life of every country.

In a similar way the reckoning of the general mass of scientific discoveries represents an independent interest in the examination of the creative activity of separate epochs. This reckoning makes us understand by what number of creative units these epochs are characterized. The individual discovery is just a creative unit, inasmuch as it indicates that corresponding creative work in general was achieved with some *success*. And success is the best measure of the productivity of creation. Therefore an account of successes, contained in scientific discoveries, is

very important means for the determination of the average level of scientific creative productivity of the given epoch.

The nature of the statistical method which we used inevitably imposed on us the obligation to begin our investigation from the time for which the number of discoveries, defining the average level of creative productivity, becomes more or less considerable.

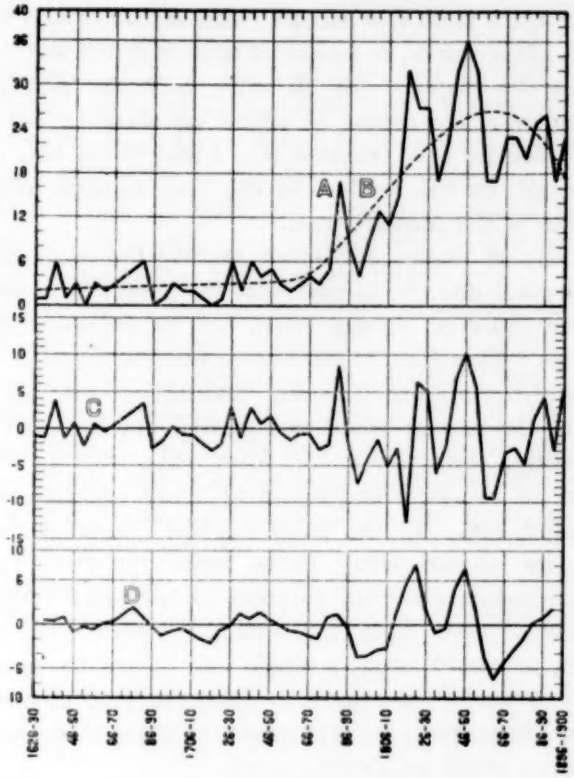
In the history of the development of physics, which was the special object of our investigation, such a time could be considered the period beginning approximately from the last decades of the eighteenth century. Earlier data in figures are so slight that their statistical value must be recognized as quite inconsiderable. Bearing this in mind, we nevertheless took the figures also of an earlier period, because, even with all their insufficiency, they could hint at interesting facts. Counting up the numbers of discoveries, in order to obtain larger figures, we took ***not yearly but five-yearly sums of these.***

It was further necessary to decide how to reckon the number of discoveries according to the countries of the discoveries, or independently of these. For different considerations we chose the former method. Then we decided to limit ourselves only to three European countries — England, France and Germany. (We took as a territorial basis for the latter the territorial frontiers of 1870-1914).

In counting the number of physical discoveries in these countries we proceeded from F. AUERBACH's « Geschichtstafeln der Physik » (1910), which, as is known, were brought up to 1900. But because in this catalogue discoveries are not divided according to countries we ourselves carried out this division, being guided by data which it was possible to take from the capital bio-biobliographical encyclopedia of POGGENDORF, with its subsequent continuations. So we obtained a table of the number of physical discoveries, by five-year periods in the three above mentioned countries. (See in appendix Tables 1-3, first columns).

If we had represented these data graphically we would have reached the conviction that the dynamics of change of the number of physical discoveries ***in all*** three countries are characterized by ***three*** traits, common to them all. The upward curve of the movement of discoveries in France gives a plain indication of these. (See diagram No. 1).

FIG. 1.



First, the number of discoveries, from the beginning of the period taken up to 1900, reveals a more or less distinct *tendency* of change, characterizing the series *on the whole*. This tendency corresponds to what in the language of contemporary statistics is called secular trend.

Second, the tempo of change of the number of discoveries does not remain the same. Here accelerated, there delayed, by this very fact it gives fluctuations of more or less long duration about the line of secular trend, by which it would be possible to represent the general tendency of the mass of discoveries toward growth.

Third, these fluctuations, these waves, are uneven — they are interspersed with a series of zigzags.

What really interested us are the mentioned long temp fluctuations in the tempo of change of the number of discoveries. In order to examine them better it was necessary, so far as possible,

to separate them from that secular trend around which they were formed (in other words, to construct models of the waves). With this object the material for all three countries was subjected to working over, the course of which we show by the example of France (See for this Diagram No. 1 and Table No. 1).

First of all, by the method of the least squares, was carried out the line of the secular trend.

In the case of France, for which country the curve of original data of physical discoveries embraces the period from 1625-1630, the secular trend of change could not be represented by one smooth line. Therefore, in accordance with statistical practice (4), the curve of the original data was divided into two sectors, and the line of the secular trend was carried out for each of them independently. For the sector from 1625-1630 to 1760-1770 the course of secular trend could be more exactly represented by a straight line. To the more crooked course of the secular trend on the second sector (from 1760-1770 until 1900) best of all corresponds a certain parabola of the third order. With the mentioned main lines intersecting between 1760 and 1765 we obtain, as would seem, a single line of secular trend, about which, as is visible according to Diagram No. 1, proceed the long temp fluctuations in the tempo of change of the number of discoveries which we already noted.

In order to obtain the model of these fluctuations it is necessary, as is customarily done in statistics, to take the alternative deviations of the curve of the original data from the line of secular trend which has just been drawn. This operation is called the elimination of the secular trend. Being interested only in the configuration of these deviations, we can then relate them to the conditional straightline level, which we did on Diagram No. 1 (middle curve).

As we already noted, these long waves in the tempo of change of the number of discoveries are interspersed with smaller zigzags. Possessing independent interest, the zigzags obscure the configuration of the long waves which are now occupying us. We can free ourselves from the zigzags by subjecting the just obtained deviations of the curve of the original data of the number of discoveries from the line of the secular trend to the so-called moving average method (by three dots). As a result

(4) See MILLS. Statistical Methods. 1924. p. 306.

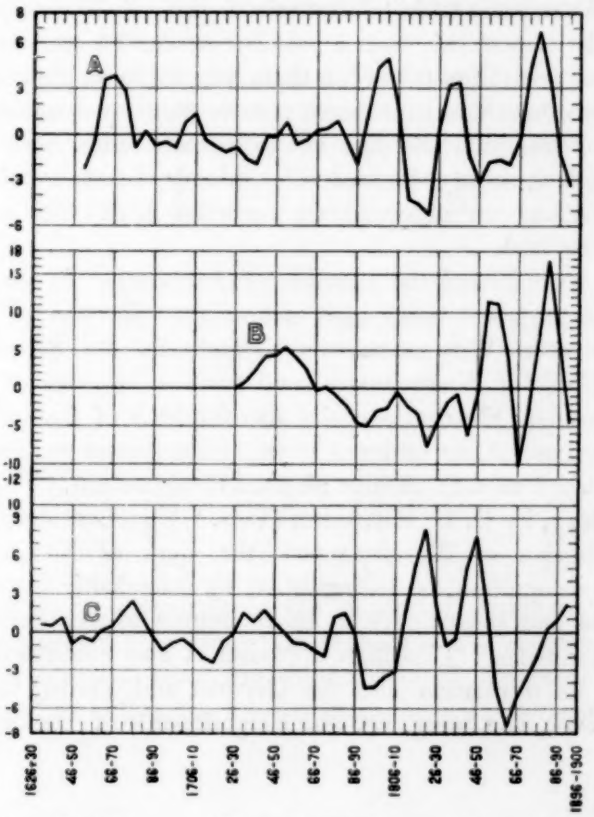
we have the pure contours of the curves which interest us (lower curve on diagram No. 1). Of course this is only a model, the real significance of which must be appraised by glancing at the issuing upper curve of the original data of five-year sums of physical discoveries. And it is not difficult to see that our model adequately corresponds to the mentioned curve.

Because of lack of space we cannot represent graphically all the stages of the analogous working over of the original data of physical discoveries in England and Germany.

We shall only note that the line of the secular trend of changes of this series for England (from 1645 until 1900) is made up by putting together a straight line for the period from 1645 until 1790-1800) and a parabola of the third order (for the remaining part of the series). After the elimination of the secular trend the model of long waves in the tempo of change of the number of physical discoveries in England, in its final form, is presented on Diagram No. 2 (Table No. 2).

As concerns Germany (series of five-year sums of discoveries

FIG. 2.



A — England B — Germany C — France

from 1600-1605 until 1900), for the expression of the secular trend of the number of physical discoveries we succeeded in working one curve (See table No. 3).

Excluding this secular trend we obtained a model of the long waves of creative productivity in German physics. On Diagram No. 2 this model is presented for the period of time from 1726-30, when, in accordance with the growing fullness of material, the waves become sufficiently distinct.

Using our diagrams we can affirm that in the tempo of change of the number of physical discoveries in England, France and Germany there took place (up to 1900) long temp fluctuations, each one of some decades. The intensity of creative activity of scientists in the realm of physics alternatively strengthened and weakened in each of these countries.

Such is the result of the statistical working over of material, taken from the tables of AUERBACH. It was necessary to put the question, what was the historical reliability of this account.

The answer depended upon the degree of historical completeness of the basic tables of AUERBACH.

In this respect we had a number of well-founded doubts. Having no possibility to explain them here we must limit ourselves to the statement that in order to remove them we found it necessary to check upon the data of AUERBACH's tables with the aid of other data, mostly obtained ***independently*** of AUERBACH's tables. With this end we undertook the compilation of other and possibly ***fuller*** tables.

Here we followed the example of AUERBACH. In making up his tables he used as his main source the collection of physical discoveries in WINCKELMANN's « Handbuch der Physik », the encyclopedia of POGGENDORFF, and various histories of physics (ROSENBERGER, HELLER, partially also the book of DARMSTÄDTER.)

At the base of our tables of physical discoveries we, like AUERBACH, placed an authoritative physical compendium, « The Course of Physics », by O. D. KHVOLSON (Vols. I-V). Less detailed than the collection of WINCKELMANN, the work of KHVOLSON, by general recognition, is distinguished by remarkable factual completeness and impartiality in its references to discoveries made in all countries. This high appraisal is also confirmed by the fact of its translation into the German and French languages.

However, not being, like the « Handbuch » of WINCKELMANN,

actually an historical work, the « Course » of KHVOLSON contains references, mostly to discoveries made since the middle of the nineteenth century. The earlier period is poorly represented in his work. Therefore — once again according to the example of the AUERBACH — it was necessary to cite actual historical sources in order to compile chronological tables of discoveries. Among these we first of all went into the latest « Geschichte der Physik » (1926), by E. HOPPE, which is especially convenient because it constitutes an unsually complete and systematic summary of scientific discoveries, divided in chronological order according to the basic departments and problems of physics. Besides, this we also used two books by MACH — « Principien d. Wärmelehre » (1923), and «Principien d. physikalischen Optik» (1921). Finally, ***after the compilation*** of tables on the basis of all the mentioned sources, we compared them with the tables of AUERBACH, taking over from the latter into our tables what little was to be found ***only*** in AUERBACH. For several reasons we limited our tables to the period from 1771 until 1900. Besides, we intentionally included in them ***only*** discoveries in the sphere of physics — ***heat***, ***light***, ***electricity*** and ***magnetism***.

As a result of all this the data of our tables for the mentioned period were numerically richer than those of AUERBACH for the same period, notwithstanding the fact that the latter embrace ***all*** departments of physics. The relation between our tables and those of AUERBACH is illustrated by the following data :

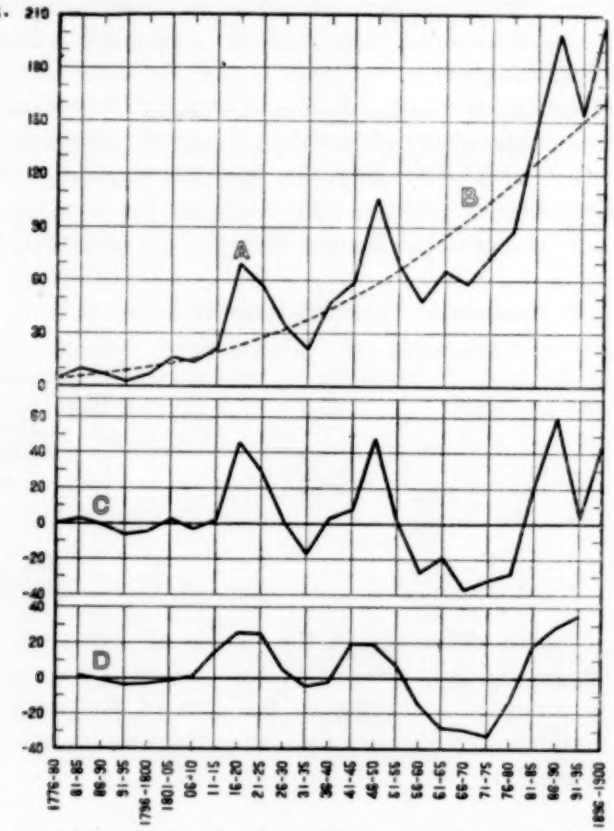
NUMBER OF DISCOVERIES FROM 1771-1900

Country	Our tables	Auerbach's tables	Relation of number of discoveries in our tables to number in Auerbach's tables, in percentages.
France	1592	502	317
England	1405	566	250
Germany . . .	2863	1273	225
Sum	5860	2341	250

Such a sharp difference in the details of AUERBACH's tables and of our permit us to think that, if the waves of creative activity which we revealed according to the data of AUERBACH should also be confirmed by our own data, then these waves must possess historical reality.

The statistical data, obtained on the basis of an account of the number of discoveries, *according to five-year periods* in our tables, were subjected to the same working over as those data which were taken from the tables of AUERBACH. For example, the working over for France went thus. Placing on a curve the original data of five-year sums of physical discoveries, we became convinced that this series clearly points to the existence of long fluctuations in the tempo of change of the number of discoveries. In order to construct the model of these waves through the series first was drawn a line of secular trend. It was a sort of exponential curve. Then the deviations of the original data from it were taken. Smoothing them according to the moving-average method (by three dots) we got the model of long temp fluctuations or of long waves in the tempo of changes of the number of physical discoveries in France. All stages of the working over of materials for this country are represented graphically on Diagram No. 3 and in Table No. 4.

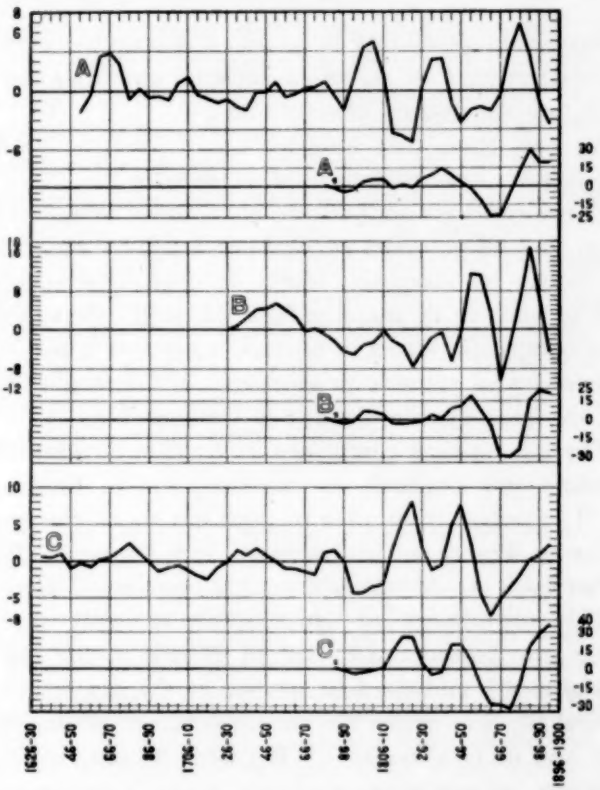
FIG. 3.



A — Original data. B — Secular trend. C — Deviations from the fitted curve. D — Deviations averaged by 3.

The data for England and Germany were also subjected to an analogous working over. Without citing here all the stages of this working over (See Tables No. 5 and 6) we confine ourselves to the communication of its results — the models of long temp fluctuations of creative activity in the physics of England and France. In Diagram No. 4 they are placed in comparison with corresponding curves, constructed according to the data of the tables of AUERBACH.

FIG. 4.



A — England (AUERBACH's Tables). B — Germany (AUERBACH's Tables).
A_1 » (Author's »). B_1 » (Author's »).
C — France (AUERBACH's Tables).
C_1 » (Author's »).

From this comparison it is easy to see that the waves which it is possible to reveal according to the tables of AUERBACH in substance are *fully confirmed by the data drawn from our own*

tables. And because these latter are more detailed than the tables of AUERBACH by two or three times and more, it is impossible to think that the dynamic of discoveries according to our tables simply reproduces the dynamic, resulting from the tables of AUERBACH. Long fluctuations of creative activity in recent European physics exist, apparently, historically, and not only statistically (in our tables). Further on we will form judgments about these fluctuations, basing ourselves on the graphic results of the working over of the data of our detailed tables.

Not having the possibility to go into a description of the forms and successivenesses of waves in separate countries we confine ourselves to some general observations :

1. We can state that long waves of creative productivity in every country have periods of some decades.

2. These waves are not periodic in the strict sense of the word. However, they all possess a cyclical character, by which we mean a reproduction by successive waves of single-type stages of rise and fall of activity in more or less different intervals of time.

3. In comparing waves in separate countries it may be noted that the waves of creative productivity in German and English physics are quite synchronized (See Diagram No. 4).

4. There is no such complete synchronism between the waves in Germany and England, on one side, and in France, on the other. The period from 1830 to 1900 has much the same characteristics in France as in Germany and England. But if we go further back we do not note such a correspondence.

5. This disturbance of synchronism is easily explained if one takes into consideration that in France in the last quarter of the eighteenth and the first quarter of the nineteenth century all cultural life was under the strong influence of the Great Revolution and its consequences. But here we have no possibility to enter into a consideration of this question and must confine ourselves merely to general observations.

We note by the way, that the confirmation of AUERBACH's data by our more detailed data for the period 1771-1900 compels us to accord a certain amount of confidence to his data also beyond the limits of this stretch of time, in the seventeenth and eighteenth centuries. Long waves, apparently, existed in European physics

also then, but evidently bore a different character from that which prevailed later.

Compelled by insufficiency of space to break off here the exposition of our observations on the prolonged waves from 1771 until 1900, we shall complete, in conclusion, with one very important remark. This is that the waves which we revealed in the tempo of change of the number of physical discoveries are phenomena, which are connected with other phenomena in the social history of that time.

In the economic literature of the last decades has been established the existence of long waves in the *economic* dynamics of all the main West-European countries (5). Disputes still go on regarding the question in which countries or elements of economic life these waves are reflected. It is generally recognized that they exist, in any event, in the 19 cent, in the movement of the general price-level and of prices of coal, wheat, cotton and other individual goods. The same waves are firmly established in the dynamics of trade turnover (as expressed in money), in the movement of interest rate, nominal wages, in the price of bonds etc. — in brief, in the movement of the so-called value indices of economic dynamics. In all these spheres long waves represent long temp fluctuations in the tempo of change of prices, wages, trade, turnover, etc.

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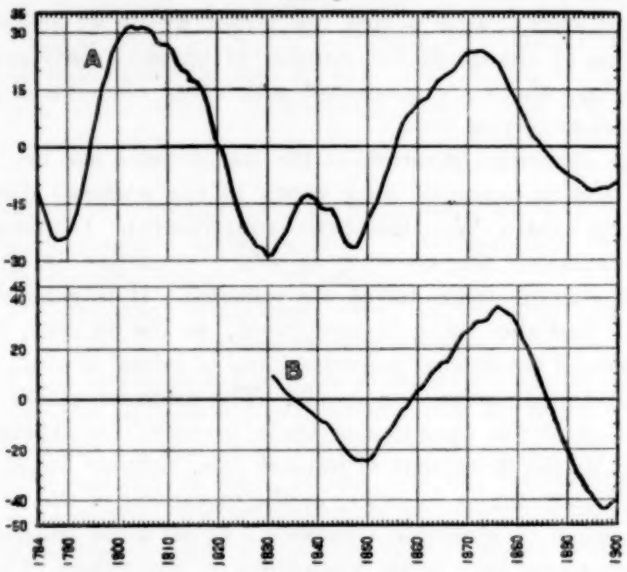
(5) See STANLEY JEVONS. The variation of price and the value of currency since 1782 (*Journal of the Statistical Society*, 1865). WICKSELL. Geldzins und Güterpreise. 1896 (SS. 150-162.) PARVUS. Handelskrisis und Gewerkschaften. 1896. KAUTSKY. a) Krisentheorien (*Neue Zeit*, 2, 1902). b) Gold, Papier und Ware (*Neue Zeit*, XXX, 1, 1912. AFTALION. Les crises périodiques de surproduction, I, 1913; préface. LENOIR. Etudes sur la formation et le mouvement des prix. 1913. MOORE. Generating economic cycles 1923 (chap. 3.). MILDSCHUH. Kreditinflation und Geldtheorie. (*Archiv fûr Sozialwissenschaft und Sozialpolitik*, 1924, Bd. 52, Hft I). DE WOLFF. Prosperitaets- und Depressionsperioden (Festgabe f. K. KAUTSKY : Der Lebendige Marxismus, 1924). KONDRATIEFF. a) Die langen Wellen der Konjunktur (*Archiv f. Sozialwissenschaft u. Sozialpolitik*, Bd. 56, Heft 3, 1926). b) K-FF and OPARIN, Bolshije cicly conjuncturi (russ.) 1928. c) K-FF. Die Preisdynamik d. industriellen und landwirtschaftlichen Waren (*Archiv f. Sozialpolitik*, Bd. 60, H. 1, 1928, SS. 31 ff.) SPIETHOFF. Krisen (*Handwoerterbuch d. Staatswissenschaften*, 4. Aufl., Bd. VI, 1925). GUBERMAN. Problemi bolsich i malich ciclow (*Sozialistitsheskoje Chosjaistwo*, 1927, 1, russ.) BASAROW. Capitalistitsheskije cicli... 1927 (russ.). PIETRI-TONNELLI. Traité d'économie rationnelle 1927 (Chap. VI). MITCHELL. Business cycles. 1927. HERZENSTEIN. Sushchestwujut il bolshije cicly conjuncturi 1928 (criticism of KONDRATIEFF).

Furthermore it is possible to be convinced that between the long waves of creative productivity which we revealed and the just mentioned waves in economic life exists an undoubted and easily traced connection.

FIG. 5.



On Diagram No. 5 (6) the upper curve A represents the model of the long waves in the movement of the general price-index in England. It is created by the same methods as our curves. We further note that it is ***typical*** for long waves in a ***whole series*** of value indices of British economic life. Comparing this curve with the curve of long waves in English physics according to the data of our detailed tables, we establish the following facts :

1. The long waves in the movement of the general price level and in general of a whole series of value indices of British economic life from 1780 until the end of the nineteenth century took place, generally speaking, in correspondence with the long temp fluctuations of creative productivity in English physics of the same period.

2. This correspondence bore now a direct, now an inverted character.

(6) KONDRATIEFF. See *Archiv. f. Sozialwiss.*, Bd. 56, Heft 3.

3. Between 1780 and 1830 this correspondence, for the most part, bore a direct character. Between 1830 and 1900 it became predominantly inverted.

Turning to France we first cite the diagram of long waves in the turnover of foreign trade, *characteristic* for the movement of its main value indices (See Diagram No. 5, curve B) : this is the most long and uninterrupted series at the disposal of contemporary statistics of French economic life, but even this is short, beginning only from the thirties of the nineteenth century.

From the comparison of this curve with our curve of long waves in French physics (See Diagram No. 4) emerge the following facts :

1. The long waves in the foreign trade of France from the thirties of the nineteenth century, and also a number of other economic indices are in correspondence with the long waves of creative productivity in physics.

2. This correspondence bears an almost exclusively inverted character.

For Germany general imperial statistics begin only from the seventies, and up to this time there is only a series of substitute of general German economic indices. On the basis of these it is established that the tempo of growth of German prices from 1843 until 1873 is characterized by a rising tendency, while from 1874 until 1894 a reverse tendency manifested itself.

Comparing these data with our curve of creative productivity in German physics (Diagram No. 4) we note that also here :

1. Between long waves in the development of physics and the same waves in the movement of prices there was, in general, correspondence.

2. This correspondence for the mentioned period bore an inverted character.

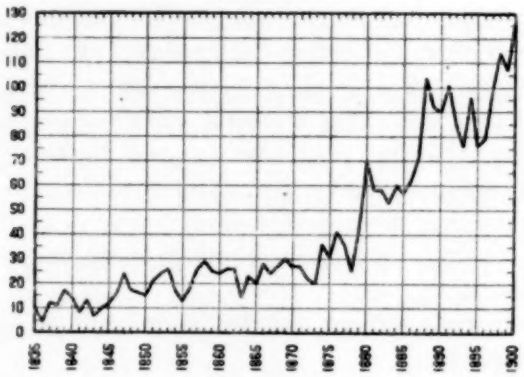
We possess a series of statistical and qualitative data which would permit us to make at least some preliminary explanation of the mentioned correspondence between long waves in the development of West-European physics and economic life. But from insufficiency of space we are deprived of the possibility to reproduce here and analyze all these data.

Breaking off here our considerations in regard to long waves of creative productivity in the history of physics, we shall further briefly touch on the question of the « short waves ».

We know that curves of the original data of the number of physical discoveries for separate countries are characterized by three traits. First a *secular* trend belongs to the series on the whole. Second, about the line which expresses this tendency rise and fall the *long waves* which we revealed in the tempo of the change of discoveries. Finally, these waves *(until they are smoothed out by the moving average method)* are interspersed with a series of zigzags.

Hitherto we have stood aside from these zigzags. It is possible, however, to attempt to explain whether they as well represent a development of a wave-like character. In order to reveal this it was necessary to have at our disposal a series of discoveries not by five-year but by annual periods. Our detailed tables gave us such a series (see Appendix). It was necessary to confine ourselves to the period of time, beginning with the thirties of the nineteenth century and even later, because up to that time yearly figures of discoveries were too few for purposes of statistical investigation.

FIG. 6.

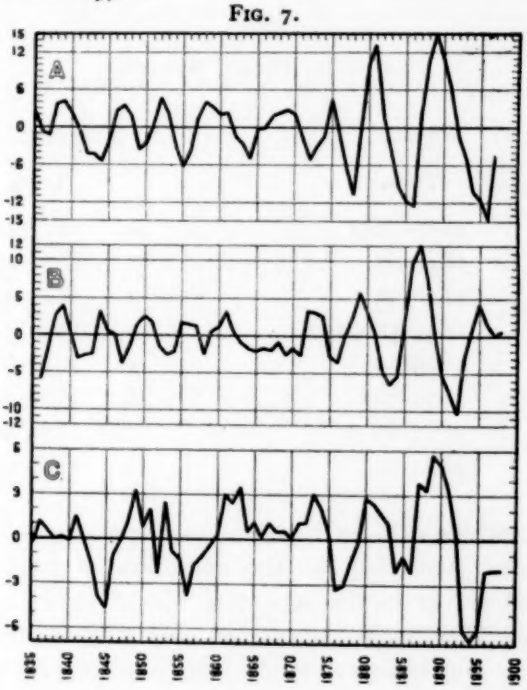


Curve No. 6 represents the yearly course of the number of physical discoveries in Germany. In it is clearly perceptible a secular trend toward growth. After this are visible long fluctuations in the tempo of growth, which we have already examined above (See above Diagram No. 4). Finally the zigzags on the long waves strike one's eye. These are zigzags of different orders. The largest of them as it clearly stande out, represent wavelike formations, each one of a length *of some years*. It is these which now interest us.

Lacking space, we cannot cite data about the stages of working over of material (7), permitting us to construct the model of these small waves. The substance of the method used here comes to this, that with the help of the method of the least squares and the moving average method, we carried out for the rough series of yearly numbers of discoveries of the line of secular trend, then, excluding this trend, we obtained long waves; immediately after the elimination of the latter, there remained only short waves, interspersed with small zigzags, which were removed by the application of the moving average (See table No. 7).

In such manner were constructed the models of short waves for our three countries, represented on Diagram No. 7 (See tables Nos. 8 and 9).

FIG. 7.



A — Germany. B — England. C — France.

The length of the waves varies between 5-9 years (reckoning from maximum to minimum), but on the average is equal to seven or eight years.

(7) Miss O. E. PRJACHINA's method.

It is not only in changes of creative productivity in the sphere of physics that waves of this kind exist. They are long and well known in economics.

We note that for a « wave » we conditionally take in the history of physics, here and above, the distance from minimum to minimum. And just so in economics we reckoned for one wave the total of the processes of change in the tempo of economic life from depression to depression, i.e. from one minimum to another.

The comparison below shows that for England, for example, between short waves in the development of physics and in the development of economic life exists a sufficiently satisfactory *synchronism* and *direct* correspondence.

ENGLAND (Short waves).

	Physics.		*Economic Life* (8).
	Years.		Years.
1.	1836-1841	1.	1833-42
2.	1842-47	2.	1843-49
3.	1848-53	3.	1849-55
4.	1854-58 (59?)	4.	1856-58
5.	1859-69	5.	1859-68
6.	1870-76	6.	1869-79
7.	1877-83	7.	1879-86
8.	1884-92	8.	1886-95

We do not cite data for the same correspondence for Germany and France. According to the condition of our information about short waves in the economic life of these countries correspondence here could be revealed only with the aid of certain explanations and analyses, which lack of space prevents us from citing. However, there is no doubt regarding the existence of the mentioned correspondence also in these countries.

We wish to observe that we do not posses sufficient data for

(8) See MITCHELL. Business cycles. 1927, and THORP. Business annals. 1926 (chap. 11).

the *explanation* of this correspondence and state it as a fact which still needs illumination.

The long and short waves which we revealed in the tempo of changes in the creative productivity of West-European physics will obtain full illumination only if we do succed in finding them also in the development of other kindred sciences (especially chemistry) and in showing their relation to the evolution of technique. The author continues his work in this direction.

1928. *November. Moscow.* T. J. RAINOFF.

Table Nr. 1.

FRANCE.

NUMBER OF PHYSICAL DISCOVERIES (5-YEARLY SUMS).
(TABLES OF AUERBACH).

Years	Original data	Fitted data	Deviations from the fitted data	Deviations averaged by 3	Years	Original data	Fitted data	Deviations from the fitted data	Deviations averaged by 3
1626-30	1	2,04	-1,0		66-70	4	4,66	-0,7	-1,4
31-35	1	2,09	-1,1	0,6	71-75	3	5,79	-2,8	-1,9
36-40	6	2,15	3,8	0,5	76-80	5	7,05	-2,1	1,2
41-45	1	2,20	-1,2	1,1	81-85	17	8,42	8,6	1,5
46-50	3	2,25	0,7	-0,9	86-90	8	9,88	-1,9	-0,2
51-55	0	2,31	-2,3	-0,3	91-95	4	11,40	-7,4	-4,4
56-60	3	2,36	0,6	-0,7	96-1800	9	12,96	-4,0	-4,3
61-65	2	2,41	-0,4	0,2	1801-05	13	14,54	-1,5	-3,5
66-70	3	2,47	0,5	0,5	06-10	11	16,12	-5,1	-3,1
71-75	4	2,52	1,5	1,5	11-15	15	17,66	-2,7	1,7
76-80	5	2,57	2,4	2,4	16-20	32	19,16	12,8	5,5
81-85	6	2,63	3,4	1,0	21-25	27	20,58	6,4	8,1
86-90	0	2,68	-2,7	-0,3	26-30	27	21,91	5,1	1,8
91-95	1	2,73	-1,7	-1,4	31-35	17	23,11	-6,1	-1,1
96-1700	3	2,79	0,2	-0,8	36-40	22	24,18	-2,2	-0,5
1701-05	2	2,84	-0,8	-0,5	41-45	32	25,07	6,9	5,0
06-10	2	2,89	-0,9	-1,2	46-50	36	25,78	10,2	7,6
11-15	1	2,95	-2,0	-2,0	51-55	32	26,28	5,7	2,1
16-20	0	3,00	-3,0	-2,4	56-60	17	26,54	-9,5	-4,5
21-25	1	3,05	-2,1	-0,7	61-65	17	26,55	-9,6	-7,5
26-30	6	3,10	2,9	-0,1	66-70	23	26,28	-3,3	-5,2
31-35	2	3,16	-1,2	1,5	71-75	23	25,70	-2,7	-3,6
36-40	6	3,21	2,8	0,8	76-80	20	24,79	-4,8	-2,0
41-45	4	3,26	0,7	1,7	81-85	25	23,54	1,5	0,3
46-50	5	3,32	1,7	0,7	86-90	26	21,92	4,1	0,9
51-55	3	3,37	-0,4	0,0	91-95	17	19,90	-2,9	2,2
56-60	2	3,42	-1,4	-0,8	96-1900	23	17,46	5,5	
61-65	3	3,68	-0,7	-0,9					

Secular trend for the period from 1626-1630 to 1776-80:

$$y = 2{,}8387 + 0{,}0532\,x.$$

Secular trend for the period from 1746-50 to 1896-1900:

$$y = 20{,}581641 + 1{,}37773659\,x - 0{,}048399709\,x^2 - 0{,}003821214\,x^3.$$

Table Nr. 2.

ENGLAND.

NUMBER OF PHYSICAL DISCOVERIES (5-YEARLY SUMS).
(TABLES OF AUERBACH).

Years.	Original data	Fitted data	Deviations from the fitted data	Deviations averaged by 3	Years	Original data	Fitted data	Deviations from the fitted data	Deviations averaged by 3
1646-50	0	2,90	-2,9		76-80	5	4,89	0,1	0,9
51-55	0	2,96	-3,0	-2,3	81-85	6	5,78	0,2	-0,5
56-60	2	3,02	-1,0	-0,4	86-90	5	6,93	-1,9	-2,0
61-65	6	3,08	2,9	3,6	91-95	4	8,30	-4,3	1,0
66-70	12	3,15	8,8	3,8	96-1800	19	9,85	9,1	4,4
71-75	3	3,21	-0,2	2,8	1801-05	20	11,56	8,4	5,0
76-80	3	3,27	-0,3	-0,9	06-10	11	13,38	-2,4	1,6
81-85	1	3,33	-2,3	0,3	11-15	14	15,30	-1,3	-4,3
86-90	7	3,40	3,6	-0,7	16-20	8	17,26	-9,3	-4,6
91-95	0	3,46	-3,5	-0,5	21-25	16	19,24	-3,2	-5,2
96-1700	2	3,52	-1,5	-0,9	26-30	18	21,20	-3,2	0,5
01-05	6	3,58	2,4	0,8	31-35	31	23,12	7,9	3,2
06-10	5	3,64	1,4	1,4	36-40	30	24,96	5,0	3,4
11-15	4	3,71	0,3	-0,4	41-45	24	26,68	-2,7	-1,3
16-20	1	3,77	-2,8	-0,8	46-50	22	28,25	-6,3	-3,2
21-25	4	3,83	0,2	-1,2	51-55	29	29,64	-0,6	-1,9
26-30	3	3,89	-0,9	-0,9	56-60	32	30,82	1,2	-1,7
31-35	2	3,96	-2,0	-1,6	61-65	26	31,74	-5,7	-2,0
36-40	2	4,02	-2,0	-2,0	66-70	31	32,39	-1,4	-0,3
41-45	2	4,08	-2,1	-0,1	71-75	39	32,71	6,3	4,1
46-50	8	4,14	3,9	-0,1	76-80	40	32,69	7,3	6,8
51-55	2	4,20	-2,2	0,8	81-85	39	32,29	6,7	3,5
56-60	5	4,27	0,7	0,6	86-90	28	31,46	-3,5	-1,3
61-65	4	4,33	-0,3	-0,3	91-95	23	30,19	-7,2	-3,4
56-70	3	4,39	-1,4	0,3	96-1900	29	28,44	0,6	
71-75	7	4,45	2,5	0,4					

Secular trend for the period from 1646-50 to 1791-95 :

$$y = 3{,}800 + 0{,}0311\,x.$$

Secular trend for the period from 1746-50 to 1895-1900 :

$$y = 19{,}238736 + 1{,}979249529\,x - 0{,}007419856\,x^2 - 0{,}00575811\,x^3.$$

Table Nr. 3.

GERMANY.

NUMBER OF PHYSICAL DISCOVERIES (5-YEARLY SUMS).
(TABLES OF AUERBACH).

Years	Original data	Fitted data	Deviations from the fitted data	Deviations averaged by 3
1721-25	0	0,2	-0,2	
26-30	1	0,3	0,7	0,0
31-35	0	0,4	-0,4	0,9
36-40	3	0,5	2,5	2,4
41-45	6	0,8	5,2	4,2
46-50	6	1,0	5,0	4,3
51-55	4	1,3	2,7	5,4
56-60	10	1,6	8,4	4,1
61-65	3	1,8	1,2	2,7
66-70	1	2,5	-1,5	-0,2
71-75	3	3,2	-0,2	0,1
76-80	6	3,9	2,1	-0,9
81-85	0	4,6	-4,6	-2,3
86-90	1	5,3	-4,3	-4,5
91-95	2	6,7	-4,7	-5,0
96-1800	2	8,0	-6,0	-3,0
1801-05	11	9,4	1,6	-2,6
06-10	8	11,3	-3,3	-0,4
11-15	14	13,5	0,5	-2,3
16-20	12	16,2	-4,2	-3,3
21-25	13	19,2	-6,2	-7,7
26-30	10	22,6	-12,6	-4,2
31-35	33	26,8	6,2	-1,6
36-40	33	31,5	1,5	-0,7
41-45	27	36,9	-9,9	-6,2
46-50	33	43,1	-10,1	-0,7
51-55	68	50,2	17,8	11,5
56-60	85	58,2	26,8	11,1
61-65	56	67,4	-11,4	3,8
66-70	74	77,9	-3,9	-10,3
71-75	74	89,7	-15,7	-2,9
76-80	114	103,1	10,9	6,3
81-85	142	118,2	23,8	16,8
86-90	151	135,3	15,7	6,7
91-95	135	154,4	-19,4	-4,5
96-1900	166	175,8	-9,8	

$y = a\,x^n$; $n = 7{,}9255 = 8$

Table Nr. 4.

FRANCE.

NUMBER OF PHYSICAL DISCOVERIES (5-YEARLY SUMS). HEAT, LIGHT, ELECTRICITY, AND MAGNETISM.
(AUTHOR'S TABLES) I.

Years	Original data	Fitted data	Deviations from the fitted curve	Deviations averaged by 3
1776-80	5	4,7	0,3	
81-85	10	5,9	4,1	1,4
86-90	7	7,3	-0,3	-0,7
91-95	3	9,0	-6,0	-3,5
96-00	7	11,1	-4,1	-2,5
1801-05	16	13,5	2,5	-1,3
06-10	14	16,3	-2,3	0,9
11-15	22	19,6	2,4	15,2
16-20	69	23,4	45,6	25,8
21-25	57	27,7	29,3	25,4
26-30	34	32,7	1,3	4,5
31-35	21	38,2	-17,2	-4,1
36-40	48	44,4	3,6	-2,0
41-45	59	51,3	7,7	19,8
46-50	107	58,8	48,2	19,3
51-55	69	67,0	2,0	7,5
56-60	48	75,8	-27,8	-15,0
61-65	66	85,3	-19,3	-28,1
66-70	58	95,2	-37,2	-29,4
71-75	74	105,7	-31,7	-32,5
76-80	88	116,5	-28,5	-12,6
81-85	150	127,6	22,4	18,0
86-90	199	138,9	60,1	28,8
91-95	154	150,1	3,9	36,3
96-1900	206	161,1	44,9	

$y = 10^{f(x)}$; $f(x) = 1{,}647302 + 0{,}063846173\,x - 0{,}0014327009\,x^2$.

Table Nr. 5.

ENGLAND.

NUMBER OF PHYSICAL DISCOVERIES (5-YEARLY SUMS). HEAT, LIGHT, ELECTRICITY, AND MAGNETISM.
(AUTHOR'S TABLES).

Years	Original data	Fitted data	Deviations from the fitted curve	Deviations averaged by 3
1771-75	11	10,0	1,0	
76-80	17	10,8	6,2	0,8
81-85	7	11,7	-4,7	-0,8
86-90	9	12,8	-3,8	-4,5
91-95	9	13,9	-4,9	-2,3
96-00	17	15,2	1,8	4,0
1801-05	32	16,7	15,2	5,2
06-10	17	18,3	-1,3	5,2
11-15	22	20,2	1,8	-1,6
16-20	17	22,4	-5,4	1,2
21-25	32	24,8	7,2	-1,3
26-30	22	27,7	-5,7	6,2
31-35	48	30,9	17,1	9,3
36-40	51	34,6	16,4	14,2
41-45	48	38,9	9,1	8,9
46-50	45	43,9	1,1	2,9
51-55	48	49,6	-1,6	-1,9
56-60	51	56,3	-5,3	-11,6
61-65	36	64,0	-28,0	-24,5
66-70	33	73,1	-40,1	-23,3
71-75	82	83,7	-1,7	-6,0
76-80	120	96,1	23,9	11, 8
81-85	124	110,7	13,3	29,8
86-90	180	127,9	52,1	19,4
91-95	141	148,3	-7,3	19,5
96-00	186	172,4	13,6	

$y = 10^{(fx)}$; $f(x) = 1{,}5144727 + 0{,}02470125\,x + 0{,}00016730082\,x^2$.

Table Nr. 6.

GERMANY.

NUMBER OF PHYSICAL DISCOVERIES (5-YEARLY SUMS). HEAT, LIGHT, ELECTRICITY, AND MAGNETISM.
(AUTHOR'S TABLES)

Years	Original data	Fitted data	Deviations from the fitted curve	Deviations averaged by 3
1771-75	3	3,1	-0,1	
76-80	11	3,8	7,2	1,2
81-85	1	4,6	-3,6	-0,7
86-90	0	5,7	-5,7	-3,1
91-95	7	7,0	0,0	-0,1
96-00	14	8,6	5,4	6,9
1801-05	26	10,6	15,4	6,3
06-10	11	13,0	-2,0	4,2
11-15	15	15,9	-0,9	-3,5
16-20	12	19,6	-7,6	-3,5
21-25	22	24,1	-2,1	-2,4
26-30	32	29,6	2,4	-1,4
31-35	32	36,4	-4,4	3,8
36-40	58	44,7	13,3	1,3
41-45	50	54,9	-4,9	9,6
46-50	88	67,5	20,5	11,2
51-55	101	82,9	18,1	19,6
56-60	122	101,9	20,1	7,3
61-65	109	125,2	-16,2	-4,7
66-70	136	153,9	-17,9	-29,1
71-75	136	189,2	-53,2	-30,2
76-80	213	232,5	-19,5	-24,2
81-85	286	285,8	0,2	16,2
86-90	419	351,2	67,8	23,5
91-95	443	431,6	2,4	21,6
96-1900	525	530,4	-5,4	

$y = 10^{f(x)}$; $f(x) = 1{,}605306 + 0{,}044773\,x$.

Table Nr. 7.

GERMANY

NUMBER OF PHYSICAL DISCOVERIES (YEARLY SUMS). HEAT, LIGHT ELECTRICITY, AND MAGNETISM.

(AUTHOR'S TABLES)

Years	Original data	Fitted data	Deviations from the fitted data	Long waves	Deviations from the long waves	Short waves
1835	10	7,9	2,1	0,6	1,5	-2,5
36	4	8,2	-4,2	1,0	-5,2	-0,8
37	12	8,6	3,4	1,4	2,0	-1,2
38	11	8,9	2,1	1,5	0,6	3,9
39	17	9,3	7,7	1,5	6,2	4,3
1840	14	9,7	4,3	1,5	2,8	2,2
41	8	10,1	-2,1	1,8	-3,9	-0,3
42	13	10,5	2,5	1,9	0,6	-4,2
43	7	11,0	-4,0	2,1	-6,1	-4,2
44	10	11,4	-1,4	2,3	-3,7	-5,4
1845	12	11,9	0,1	2,4	-2,3	-2,2
46	16	12,4	3,6	2,7	0,9	2,6
47	24	13,0	11,0	3,5	7,5	3,5
48	17	13,5	3,5	4,2	-0,7	1,8
49	16	14,1	1,9	4,6	-2,7	-3,5
1850	15	14,7	0,3	4,6	-4,3	-2,5
51	21	15,3	5,7	4,5	1,2	0,4
52	24	15,9	8,1	4,2	3,9	4,7
53	26	16,6	9,4	4,1	5,3	2,2
54	17	17,3	-0,3	3,9	-4,2	-2,8
1855	13	18,0	-5,0	4,0	-9,0	-6,4
56	18	18,8	-0,8	3,9	-4,6	-3,8
57	26	19,6	6,4	3,3	3,1	1,6
58	29	20,4	8,6	2,6	6,0	4,0
59	25	21,2	3,8	1,9	1,9	3,1
1860	24	22,1	1,9	1,1	0,8	1,9
61	26	23,1	2,9	0,1	2,8	2,3
62	26	24,0	2,0	-0,6	2,6	-1,4
63	14	25,0	-11,0	-1,6	-9,4	-2,7
64	23	26,1	-3,1	-2,5	-0,6	-5,0
1865	20	27,2	-7,2	-3,4	-3,8	-0,2
66	28	28,4	-0,4	-4,1	3,7	-0,1

Table Nr. 7 (cont.).

Years	Original data	Fitted data	Deviations from the fitted data	Long waves	Deviations from the long waves	Short waves
1867	24	29,5	-5,5	-5,2	-0,3	1,9
68	27	30,8	-3,8	-5,9	2,1	2,3
69	30	32,1	-2,1	-6,7	4,6	2,8
1870	27	33,4	-6,4	-7,4	1,0	2,1
71	27	34,8	-7,8	-7,9	0,1	-1,6
72	22	36,3	-14,3	-8,6	-5,7	-5,1
73	20	37,8	-17,8	-9,3	-8,5	-3,0
74	36	39,4	-3,4	-9,2	5,8	-1,5
1875	31	41,1	-10,1	-8,7	-1,4	4,5
76	41	42,8	-1,8	-7,5	5,7	-0,8
77	36	44,6	-8,6	-6,0	-2,6	-6,4
78	25	46,5	-21,5	-4,1	-16,4	-10,8
79	41	48,5	-7,5	-3,1	-4,4	0,1
1880	70	50,5	19,5	-2,2	21,7	10,2
81	58	52,6	5,4	-1,4	6,8	13,2
82	58	54,8	3,2	0,6	2,6	1,2
83	53	57,2	-4,2	2,4	-6,6	-3,4
84	60	59,6	0,4	4,4	-4,0	-9,5
1885	57	62,1	-5,1	6,9	-12,0	-11,7
86	62	64,7	-2,7	8,8	-11,5	-12,5
87	71	67,4	3,6	9,4	-5,8	2,5
88	104	70,2	33,8	10,4	23,4	10,9
89	92	73,2	18,8	10,6	8,2	15,0
1890	90	76,3	13,7	9,8	3,9	10,9
91	101	79,5	21,5	7,9	13,6	5,9
92	85	82,8	2,2	5,8	-3,6	-1,5
93	76	86,3	-10,3	3,2	-13,5	-5,0
94	96	90,0	6,0	0,6	5,4	-10,3
1895	76	93,7	-17,7	-1,3	-16,4	-11,7
96	79	97,7	-18,7	-2,0	-16,7	-14,9
97	99	101,8	-2,8	-0,8	-2,0	-4,8
98	114	106,1	7,9	0,5	7,4	
99	107	110,6	-3,6			
1900	126	115,2	10,8			

Curve of the secular trend — See table No. 6.

Table Nr. 8.

ENGLAND

NUMBER OF DISCOVERIES (YEARLY SUMS). HEAT, LIGHT, ELECTRICITY, AND MAGNETISM.
(AUTHOR'S TABLES)

Years	Original data	Fitted data	Deviations from the fitted data	Long waves	Deviations from the long waves	Short waves
1835	4	6,5	-2,5	3,8	6,3	
36	4	6,6	-2,6	3,6	-6,2	-5,8
37	8	6,8	1,2	3,0	-1,8	-1,5
38	14	6,9	7,1	2,8	4,3	2,8
39	14	7,1	6,9	2,6	4,3	4,0
1840	11	7,3	3,7	2,5	1,2	0,2
41	5	7,4	-2,4	2,4	-4,8	-3,1
42	6	7,6	-1,6	2,3	-3,9	-2,7
43	12	7,8	4,2	2,1	2,1	-2,4
44	6	8,0	-2,0	1,7	-3,7	3,2
1845	19	8,2	10,8	1,5	9,3	0,7
46	6	8,4	-2,4	1,5	-3,9	0,1
47	5	8,6	-3,6	1,6	-5,2	-3,8
48	10	8,8	1,2	1,4	-0,2	-1,5
49	12	9,0	3,0	1,2	1,8	1,5
1850	12	9,2	2,8	0,9	1,9	2,7
51	13	9,4	3,6	0,7	2,9	1,9
52	10	9,7	0,3	0,3	0	-0,5
53	6	9,9	-3,9	0,2	-4,1	-2,6
54	8	10,2	-2,2	-0,1	-2,1	-2,1
1855	11	10,4	0,6	-0,6	1,2	1,8
56	15	10,7	4,3	-1,0	5,3	1,6
57	7	11,0	-4,0	-1,4	-2,6	1,3
58	10	11,3	-1,3	-1,8	0,5	-2,6
59	5	11,5	-6,5	-2,4	-4,1	0,6
1860	14	11,8	2,2	-3,0	5,2	1,1
61	10	12,2	-2,2	-3,8	1,6	3,2
62	9	12,5	-3,5	-4,6	1,1	0,5
63	6	12,8	-6,8	-5,3	-1,5	-1,0
64	5	13,1	-8,1	-6,0	-2,1	-1,8
1865	6	13,5	-7,5	-6,5	-1,0	-2,1
66	5	13,9	-8,9	-6,8	-2,1	-1,8

Table Nr. 8 (cont.).

Years	Original data	Fitted data	Deviations from the fitted data	Long waves	Deviations from the long waves	Short waves
1867	6	14,2	-8,2	-6,7	-1,5	-2,0
68	7	14,6	-7,6	-6,4	-1,2	-0,9
69	10	15,0	-5,0	-5,6	0,6	-2,6
1870	5	15,4	-10,4	-4,7	-5,7	-1,7
71	13	15,8	-2,8	-3,7	0,9	-2,6
72	12	16,3	-4,3	-2,7	-1,6	3,3
73	24	16,7	7,3	-1,6	8,9	3,1
74	17	17,2	-0,2	-0,3	0,1	2,6
1875	16	17,7	-1,7	1,1	-2,8	-2,8
76	16	18,2	-2,2	2,1	-4,3	-3,6
77	20	18,7	1,3	2,8	-1,5	-0,1
78	28	19,2	8,8	3,2	5,6	2,3
79	25	19,8	5,2	3,5	1,7	5,8
1880	31	20,3	10,7	4,0	6,7	3,1
81	25	20,9	4,1	4,9	-0,8	0,4
82	23	21,5	1,5	5,9	-4,4	-4,8
83	22	22,1	-0,1	6,6	-6,7	-6,4
84	25	22,8	2,2	7,1	-4,9	-5,3
1885	29	23,5	5,5	7,0	-1,5	1,6
86	41	24,1	16,9	6,6	10,3	9,7
87	46	24,9	21,1	5,8	15,3	12,0
88	35	25,6	9,4	5,3	4,1	7,5
89	30	26,3	3,7	4,5	-0,8	0,2
1890	28	27,1	0,9	3,5	-2,6	-5,6
91	20	27,9	-7,9	2,5	-10,4	-7,6
92	25	28,8	-3,8	1,7	-5,5	-10,4
93	21	29,7	-8,7	0,9	-9,6	-2,9
94	39	30,6	8,4	0,5	7,9	0,7
1895	36	31,5	4,5	1,1	3,4	4,2
96	33	32,5	0,5	1,6	-1,1	1,5
97	37	33,4	3,6	2,2	1,4	0
98	37	34,5	2,5	2,8	-0,3	0,6
99	39	35,6	3,4	3,0	0,4	
1900	40	36,7	3,3			

Curve of the secular trend — See table No. 5.

Table Nr. 9.

FRANCE.

NUMBER OF PHYSICAL DISCOVERIES (YEARLY SUMS). HEAT, LIGHT, ELECTRICITY, AND MAGNETISM.

(AUTHOR'S TABLES)

Years	Original data	Fitted data	Deviations from the fitted data	Long waves	Deviations from the long waves	Short waves
1835	9	8,1	0,9	-1,8	2,7	-0,3
36	6	8,3	-2,3	-1,1	-1,2	1,2
37	11	8,6	2,4	-0,2	2,6	0,6
38	10	8,9	1,1	0,5	0,6	0
39	7	9,1	-2,1	1,2	-3,3	0,1
1840	14	9,4	4,6	1,7	2,9	-0,1
41	12	9,7	2,3	2,2	0,1	1,6
42	15	9,9	5,1	2,8	2,3	-0,1
43	11	10,3	0,7	3,4	-2,7	-1,6
44	10	10,5	-0,5	4,6	-5,1	-3,9
1845	11	10,8	0,2	5,5	-5,3	-4,7
46	12	11,1	0,9	6,3	-5,4	-1,2
47	25	11,4	13,6	6,8	6,8	-0,1
48	18	11,8	6,2	7,8	-1,6	1,1
49	18	12,1	5,9	7,6	-1,7	3,3
1850	34	12,4	21,6	7,2	14,4	0,8
51	9	12,7	-3,7	6,2	-9,9	2,0
52	20	13,1	6,9	4,9	2,0	-2,3
53	16	13,4	2,6	2,5	0,1	2,4
54	20	13,7	6,3	0,4	5,9	-0,8
1855	4	14,1	-10,1	-1,5	-8,6	-1,3
56	10	14,4	-4,4	-2,8	-1,6	-3,8
57	8	14,8	-6,8	-4,2	-2,6	-1,7
58	9	15,2	-6,2	-4,7	-1,5	-1,2
59	10	15,5	-5,5	-5,3	-0,2	-0,4
1860	11	15,9	-4,9	-5,5	0,6	0,3
61	11	16,3	-5,3	-5,8	0,5	3,0
62	20	16,7	3,3	-5,7	9,0	2,5
63	10	17,1	-7,1	-5,9	-1,2	3,5
64	15	17,4	-2,4	-6,2	3,8	0,5
1865	10	17,8	-7,8	-6,8	-1,0	1,2
66	12	18,2	-6,2	-7,3	1,1	0,1

Table Nr 9 (cont.).

Years	Original data	Fitted data	Deviations from the fitted data	Long waves	Deviations from the long waves	Shor waves
67	11	18,6	-7,6	-7,9	0,3	1,1
68	13	19,0	-6,0	-8,1	2,1	0,5
69	10	19,5	-9,5	-8,5	-1,0	0,6
1870	12	19,9	-7,9	-8,6	0,7	0,1
71	12	20,3	-8,3	-8,8	0,5	1,2
72	15	20,7	-5,7	-8,7	3,0	1,2
73	13	21,1	-8,1	-8,7	0,6	3,1
74	20	21,6	-1,6	-8,5	6,9	2,1
1875	14	22,0	-8,0	-7,6	-0,4	0,5
76	11	22,4	-11,4	-6,3	-5,1	-3,3
77	12	22,9	-10,9	-5,2	-5,7	-3,1
78	20	23,3	-3,3	-3,6	0,3	-1,5
79	22	23,7	-1,7	-2,1	0,4	-0,1
1880	23	24,2	-1,2	-0,2	-1,0	2,8
81	36	24,6	11,4	1,1	10,3	2,5
82	27	25,1	1,9	2,8	-0,9	1,7
83	26	25,5	0,5	4,3	-3,8	1,2
84	40	25,9	14,1	5,6	8,5	-2,1
1885	21	26,4	-5,4	6,6	-12,0	1,2
86	42	26,8	15,2	7,6	7,6	-2,2
87	32	27,3	4,7	7,9	-3,2	3,8
88	44	27,7	16,3	7,7	8,6	3,3
89	41	28,2	12,8	7,2	5,6	5,7
1890	40	28,6	11,4	6,5	4,9	5,0
91	41	29,1	11,9	5,5	6,4	3,4
92	34	29,5	4,5	4,5	0	0,6
93	29	30,0	-1,0	3,7	-4,7	-6,1
94	18	30,4	-12,4	3,6	-16,0	-6,8
1895	32	30,9	1,1	3,5	-2,4	-6,0
96	34	31,3	2,7	4,5	-1,8	-2,1
97	35	31,7	3,3	6,3	-3,0	-2,0
98	39	32,2	6,8	9,0	-2,2	-2,0
99	43	32,6	10,4	12,2	-1,8	
1900	55	33,0	22,0			

Curve of the secular trend — See table No. 4.

Medallic Illustrations of the History of Science.

(First Series : XIXth and XXth centuries).
Sixth Article.

This collection of scientific medals began to appear in volume 8 of *Isis*. The fifth article appeared in volume 12, p. 146-8, pl. 6-9, 1929. The Editor will welcome photographs or suggestions for the following parts of this series. It is intended to publish only medals having a sufficient scientific and artistic interest. Medals dedicated to scientists who are still living can not be published at once but will be considered for ulterior publication. GEORGE SARTON.

No. 30. (FRIEDRICH HEINRICH) ALEXANDER (Baron) VON HUMBOLDT. Born, Berlin, 1769; died, Berlin, 1859. German naturalist, traveller, encyclopaedist. One of the founders of physical geography and of meteorology. *Kosmos* (1845, 1847, 1850-58, 1862).

Artist : DANIEL FRIEDRICH LOOS. German medallist; born in Altenburg, 1735; died in Berlin, 1819. (FORRER's *Dictionary*, vol. 3, 461-65).

Date : 1805.

Size : 39 mm.

Collection : American Numismatic Society, New York. Communicated by Mr. HOWLAND WOOD, New York.

Obv. : Portrait (fig. 41). FRIDER. HENRIC. ALEXANDER AB HUMBOLDT.

Rev. : Fig. 42. Novi orbis Democritus. In felicem reditum Berolini MDCCCV. (The words Atlant. Ocean. can be read upon the globe).

No. 31. PASTEUR.

Artist : GEORGES HENRI PRUD'HOMME. French medallist. Born at Cap Breton, Landes. (FORRER, 4, 704-706, 1909).

No. 30. Fig. 41 and 42. A. von Humboldt.

No. 31. Fig. 43 and 44. PASTEUR.

No. 32. Fig. 45. P. CURIE.

No. 33. Fig. 46. PASTEUR.

No. 34. Fig. 47 and 48. E. W. von Brücke

Date : 1910.

Size : 73 × 52 mm.

Collection : LYMAN C. NEWELL, Boston.

Obv. : Portrait (fig. 43). LOUIS PASTEUR, 1822-1895. G. PRUD' HOMME, 1910.

Rev. : (Fig. 44) G. PRUD'HOMME.

No. 32. PASTEUR.

Artist : O. ROTY.

Date : 1922.

Size : 38 mm.

Collection : L. J. HENDERSON, Cambridge, Mass.

Obv. : Portrait (fig. 45).

Rev. : Centième anniversaire de la naissance de PASTEUR. 27 décembre 1822-1922.

No. 33. PIERRE CURIE (1859-1906). French physicist.

Artist : SÉRAPHIN EMILE VERNIER. French medallist. Born, Paris, 1852. (FORRER, 6, 225-35, 1916).

Date : 1907.

Size : 47 × 32 mm.

Collection : Cabinet des Médailles, Paris. (Courtesy of Mme H. METZGER).

Obv. : Portrait (fig. 46). PIERRE CURIE. S. E. VERNIER, 1907.

Rev. : PIERRE CURIE. Né et mort à Paris, 15 mai 1859, 19 avril 1906. Piézo-électricité. Principe de symétrie. Magnétisme. Radium et radioactivité.

École municipale de physique et de chimie, 1882-1905. Sorbonne, 1900. Prix Nobel, 1903. Institut, 1905.

No. 34. ERNST WILHELM VON BRÜCKE. German physiologist. Born in Berlin, 1819; died in Vienna, 1892. Physiological optics and acoustics; phonetics; physiology of colors and its application to the arts.

Artist : PETER BREITHUT. Austrian medallist, born at Krems, 1869 (FORRER, 1, 272, 1904).

Date : 1910.

Size : 66 mm. square.

Collection : L. J. HENDERSON, Cambridge, Mass.

Obv. : Portrait (fig. 47). Das KK. Ministerium für Kultus and Unterricht dem VIII. Intern. Physiologen Kongress. Wien 1910.

Rev. : (fig. 48).

Notes and Correspondence.

1.—International Committee of the History of Science. — The organization of such a Committee was resolved at the international historical congress of Oslo in the summer of 1928. An initial group of seven members was then appointed including : ALDO MIELI (Paris), ABEL REY (Paris), GEORGE SARTON (Cambridge, Mass.), HENRY E. SIGERIST (Leipzig), CHARLES SINGER (London), KARL SUDHOFF (Leipzig), and LYNN THORNDIKE (New York); MIELI acting as secretary. It was decided to increase the membership up to 22 full members, and later to appoint from 20 to 28 corresponding members.

After many votes, the total membership of 22 was finally attained on Dec. 28, 1928, the fifteen new members being : FLORIAN CAJORI (Berkeley, Calif.), FRANZ MARIA FELDHAUS (Berlin), CHARLES HOMER HASKINS (Cambridge, Mass.), Sir THOMAS L. HEATH (London), LOUIS C. KARPINSKI (Ann Arbor, Mich.), EDMUND O. VON LIPPMANN (Halle a.d.S.), GINO LORIA (Genoa), HÉLÈNE METZGER (Paris), MAX NEUBURGER (Vienna), EMANUEL RÁDL (Prague), JULIÁN RIBERA Y TARRAGÓ (Madrid), JULIUS RUSKA (Berlin), DOROTHEA WALEY SINGER (London,) DAVID EUGENE SMITH (New York), ROBERT STEELE (London).

A first meeting will be held at the Centre international de synthèse, Hotel de Nevers, 12 rue Colbert, Paris, II, from May 20 to 25, 1929. The organisation will them be formally completed. In the meanwhile corresponding members will be elected, and in the future full members will be recruited only from among the corresponding members.

Beldomandi ou Beldamandi ? — C'est un grand mérite du regretté savant A. FAVARO que d'avoir fait obtenir la place à laquelle il a droit dans l'histoire des mathématiques à PROSDOCIMUS DE' BELDOMANDI. Les mémoires qu'il a consacrés à ce savant dans les Tomes XII et XVIII du *Bullettino di bibliografia e storia delle scienze matematiche* sont le fruit de longues recherches accomplies dans les archives de Padoue, où habitait l'ancienne famille à laquelle appartenait ce géomètre. Or FAVARO ne s'arrête pas à discuter l'orthographe de son nom, tous les documents qu'il examina étant d'accord à écrire BELDOMANDI. Une seule exception s'est présentée : dans son *Algorismi tractatus*, publié en 1483, l'auteur est indiqué comme PROSDOCIMUS DE BELDAMANDIS.

Evidemment FAVARO (d'accord avec un connaisseur de la littérature du Moyen Age tel que le prince BONCOMPAGNI) a regardé ce fait comme une simple faute de l'imprimeur, que ce n'était pas même le cas de relever et son exemple a été suivi par les historiens européens suivants (CANTOR, GÜNTHER, etc.). Or M. D. E. SMITH dans sa magnifique publication *Rara mathematica* a reproduit le titre de l'« *Algorithmi tractatus* »; en conséquence il a été amené à retenir que le nom du savant de Padoue doit s'écrire BELDAMANDI et cela non seulement dans l'ouvrage que je viens de citer, mais aussi dans le t. I de son *History of Mathematics* (tout en faisant remarquer que la graphie de ce nom n'était pas tout à fait constante). Or je crains que la grande autorité dont jouit à bonne raison M. SMITH ne fasse répandre (particulièrement en Amérique) cette nouvelle orthographe. Comme il s'appuie sur *un seul document*, tandis que l'autre est établie par *une foule de documents*; comme d'ailleurs il est de toute nécessité que les noms soient écrits d'une manière uniforme, j'exprime le desir que tout le monde suive l'exemple donné par FAVARO; en particulier je formule le vœu qu'il le soit par M. SMITH lui même dans les nouvelles éditions dont son *History* ne peut manquer d'être honorée à l'avenir.

(*Gènes, Eté* 1928). GINO LORIA.

Query no. 12. 'UMAR AL-'ÂLIM. The history of geology forming Book I of Sir CHARLES LYELL's *Principles of Geology* is still worth consulting, though with great care, and only by scholars having a sufficient knowledge of the subject to use it critically. In this case as in all others where a historical sketch was written by a scientist, the best parts are those dealing with the latest developments, and the weakest, the mediaeval. Mr. EDWIN TENNEY BREWSTER's recent book *This puzzling planet* (1928; *Isis* 12, 341) drew my attention to a passage of LYELL's historical introduction which is as much of a puzzle to me as our planet itself.

Here it is (eleventh edition, New York edition, 1872, p. 28) « In the same century also (meaning IBN SÎNÂ's time), OMAR, — surnamed EL AALEM, or The Learned, wrote a work on The Retreat of the Sea. It appears that on comparing the charts of his own time with those made by the Indian and Persian astronomers two thousand years before, he had satisfied himself that important changes had taken place since the times of history in the form of the coasts of Asia, and that the extension of the sea had been greater at some former periods. He was confirmed in this opinion by the numerous salt springs and marshes in the interior of Asia, — a phenomenon from which PALLAS, in more recent times, has drawn the same inference. »

This statement as it stands is ridiculous, yet there may be some nucleus of truth in it. I have vainly tried to find a 'UMAR AL-'ÂLIM, or an Arabic work corresponding to LYELL's short description. Is this 'UMAR a ghost? if not, who was he?

GEORGE SARTON.

Reviews

Robert W. Theodore Gunther. — *Further correspondence* of JOHN RAY. With two portraits, also two half-tone plates and six text-figures. XXIV + 332 p., illus. (Ray Society, vol. 114) London, DULAU and Co., 1928.

I doubt whether any man has done more to promote the study of the history of English science than the author of this book. Not to speak of the LEWIS EVANS collection of scientific instruments which is now available in the Old Ashmolean of Oxford chiefly because of his energy and enthusiasm (*Isis*, 6, 542), he has published a number of valuable books tending to direct the attention of his countrymen to the scientific achievements of their ancestors. I can quote here only his most important publications; for others see *Isis* by index. *The Daubeny Laboratory register* (Oxford, 1904-24; *Isis* 7, 561; 11, 481); *Early British botanists and their gardens* (Oxford, 1922; *Isis*, 5, 230); *Early science in Oxford* (3 vols., Oxford, 1920-23-25; there is a fourth volume which I have not seen; *Isis*, 6, 449-53; 8, 375-77).

The present volume is an important addition to our knowledge of JOHN RAY, who was one of the greatest naturalists of the second half of the seventeenth century. It is a companion to two other volumes published by the same society : *the Memorials of* JOHN RAY (1846) and the *Correspondence of* JOHN RAY (1848), both edited by EDWIN LANKESTER. The second of these volumes contained far more letters addressed to RAY than written by him. Thanks to GUNTHER's energetic curiosity, this situation is now reversed in the new volume wherein are published for the first time a number of valuable letters written by RAY to various correspondents, chiefly to JOHN AUBREY, the Oxford antiquary (14 letters), and to EDWARD LHWYD (41 letters). The correspondence thus far published in these two volumes extends from 1658 to 1704. I may recall that RAY was born at Black Notley in Essex on Nov. 29, 1627 (not 1628), and that he died at Black Notley, on Jan. 17, 1704-05 (not 1705-6, as is wrongly inscribed on his tomb). GUNTHER has added to the correspondence two short lives of RAY, the one written by the latter's great friend the botanist SAMUEL DALE of Braintree (1659?-1739), the other written in 1711-12 by another friend, JAMES PETIVER (1663-1718), who was an apothecary and naturalist.

Among the other correspondents of RAY represented in these two volumes are PETER COURTHOPE of Danny, FRANCIS WILLUGHBY, MARTIN LISTER, HENRY OLDENBURGH, TANCRED ROBINSON, and HANS SLOANE. This is enough to show their interest to students of science in the second half of the seventeenth century.

By far the most important part of that correspondence is that exchanged with LHWYD (1689-1703). LHWYD's letters had been published by CARPENTER, but RAY's do now appear for the first time (p. 185-284). EDWARD LHWYD (1), the second keeper of the Ashmolean Museum in Oxford was a young naturalist of considerable promise but who died prematurely; he was at least thirty-three years younger than RAY but there is not the slightest suggestion of inequality in the letters of the older man. LHWYD was engaged in a study of fossils, and a large part of RAY's letters deals with the mysterious problems involved. RAY was deeply interested in his young friend's design of publishing a « catalogue of formed stones » but wisely counseled him not to restrict it to the neighborhood of Oxford but to extend it to the whole of England. His many discussions of the origin of fossils form a very valuable addition to what might be called the prehistory of palaeontology (see e.g., p. 219, 223, 259, 264, 278, 284). It enables us to measure how extremely difficult the problem was. The following extract from RAY's letter of Feb. 3, 1695, may serve as an example :

« I know it is a hard task to give a good Account of the originall of Fossill shels & formed stones, & a satisfactory Answer to all Objections against either opinion : & therefore a man hazards his reputation that is positive & confident on either side. The like may be said of the Delineations of Plants upon Slate or other stones. I did once embrace a middle way, to wch I see you are now somewt inclined, but now I think that if nature may form any for her disport, she may as well form all, & I see no reason of making a difference between them. And if reall shells & Fish-bones be found at great distances from the sea, it may rationally be thought that the formed stones wch are there found may ow their originall to them, especially since it is observed that oyster shells will in time thicken & grow into the shape of those stones wch (have) bene found in gravell pits & wch the vulgar heer call hobgoblins claws. »

Strangely enough the consideration of fossils entailed that of embryology. Witness this extract from a letter of March 12, 1697.

« I am of opinion with you, that the severall parts of animate bodies are made of ye severall parts of the seed. I can also easily allow that these parts may be separated & act separately from each other, as appears by monsters wanting some parts, & having others in undue places or enormously great. Only we see that the seeds of these bodies (wch are indeed nothing else but the very bodies themselves in piccolo, indeed with mentative power) grow by separating parts from

(1) About him, see *Isis*, 8, 377. The strange name LHWYD is but a variant of the better known LLOYD. RAY wrote it LLOYD.

a fluid, & continually applying them to themselves. Now it is hard to conceive how this can be done in stones. The instance of those sorts of Fern-leaves observed in ye ice of urine &c. answers not to the formation or rather ye growth of an animate body from ye seed, that being done by one simple projection at once, not to say this urine is the greatest enemy to vegetation that may be. Some objection also against this Hypothesis, for it may be, that according to Dr. WOODWARD's observation these bodies are for the most part found sunk and lodged in beds of the same specific gravity. Then the lodging of shells in beds or strata of mud or gravell, & some of them being by long lying as it were calcined & easily dissoluble to pouder doth as it were tell us, that such beds were sometimes the sea-shore, it requiring a very long time so to calcine these shels. Heer at Harwich a bed of shells hath lately been found by Mr. DALE, near the top of the cliff, at least 40 foot above ye shore; this bed of a considerable thicknesse, mixt with sand & gravell. There-in are all sorts of Bivalves & Cochleæ most of them calcined to powder or in small fitters, yet many entire, & some large turbens that have a contrary turn. (*) »

In view of the recent discussions in American newspapers (April 2, May, 4, 6, 15, 1928) apropos of the occurrence of live toads inside of stones, it is amusing to find similar cases mentioned in RAY's letters of 1692 and 1697 (p. 227, 271), which shows that there is nothing new under the sun.

GEORGE SARTON.

Armand Delatte. — *Anecdota atheniensa.* Tome 1. Textes grecs inédits relatifs à l'histoire des religions. (*Bibliothèque de la Faculté de philosophie de l'Université de Liége*, fascicule 36) VIII + 740 p. Liége, 1927.

Il faut savoir bon gré à M. DELATTE, professeur à l'Université de Liége, pour cette édition consciencieuse de nombreux textes inédits, qui nous aideront à mieux pénétrer la pensée du peuple byzantin. Je dis peuple, car la plupart de ces documents peuvent à peine être considérés comme des œuvres littéraires; comme le dit l'auteur « ils suent la vie du petit peuple ». Il faut noter que la plupart sont relativement récents; la majorité des Mss. étudiés datent des XVIIe et XVIIIe siècles, certains sont même du XIXe.

J'aurais peut-être mauvaise grâce à reprocher à l'auteur un certain manque d'ordre, car après tout, libre à chacun d'utiliser ses documents dans l'ordre qui lui plait, et nous lui devons déjà beaucoup de reconnaissance pour la tâche infiniment ingrate qu'il a accomplie. L'édition d'un beau texte, si pénible qu'elle soit, doit être une grande source de joie; mais j'admire l'auteur d'avoir édité avec tant de soin des textes aussi médiocres, parce que je serais moi-même tout à fait incapable de dépenser ainsi mon énergie et ma dévotion.

(*) *Trophon antiquus.*

Il est fâcheux cependant que les textes qui nous sont donnés n'aient point été partagés en trois groupes bien distincts : (1) magie; (2) religion; (3) physiologos.

(1) *Magie* — Le premier groupe est de beaucoup le plus important; il forme les quatre cinquièmes du total. Ce volume n'est donc pas ce que nous dit le sous-titre, mais essentiellement un recueil de recettes magiques de toutes sortes. On pourrait comparer celles-ci aux recettes égyptiennes qui ont été récemment réunies par FRANCOIS LEXA de Prague (3 vols., Paris, 1925; *Isis*, 9, 450-52). Toutes ces recettes en effet se ressemblent bien fort. Plus ça change, plus c'est la même chose. Comme je l'ai longuement expliqué à propos de l'histoire de la magie de LYNN THORNDIKE (2 vols., New York, 1923; *Isis*, 6, 74-89), je ne pense pas que l'histoire de la magie offre beaucoup d'intérêt pour l'historien de la science. Ce qui fascine celui-ci au-dessus de tout, c'est de contempler et d'expliquer le progrès du génie humain. L'activité scientifique est la plus progressive et la plus révolutionnaire de toutes les activités humaines; au contraire il n'y a rien de moins progressif, ni de plus réactionnaire que la magie. Exception faite pour les aspects plus scientifiques de l'alchimie et de l'astrologie, il n'y a donc aucun rapport entre l'activité des savants et celle des magiciens. J'ajouterai que les points de contact entre ces derniers et les esprits religieux ne sont guère plus nombreux; quand ils existent, ils sont purement accidentels. Le savant, le saint, et le magicien représentent trois types essentiellement différents. Les deux premiers sont des frères, quoiqu'ils l'oublient parfois; ils pourraient être comparés à des alpinistes gravissant la même montagne de côtés différents; il est possible qu'ils se rencontrent au sommet. Mais le troisième ne se meut que dans la boue des plaines; s'il rencontre les deux autres, ce ne sera certainement pas sur la montagne.

Il serait futile de vouloir analyser ces traités de magie. Il suffira de dire qu'on y trouve toute la gamme habituelle : lécanomantie ou évocation des esprits, formes anciennes de l'hypnotisme, rites d'envoûtement, d'ordalie, de divination, magie sympathique, usage d'alphabets secrets et de « sceaux » ou « caractères » magiques, etc. etc. Nous avons ici toutes les formes traditionnelles de divination : par les nombres ou les lettres, les songes, les lignes des mains, les omoplates, etc. Il y a aussi un grand nombre de recettes magiques indépendantes, c'est à dire qui ne se rattachent à aucun des grands groupes, — des superstitions particulières et locales. En effet il n'y a rien qui ne puisse donner lieu à des interprétations irrationnelles; tous les problèmes de la vie peuvent suggérer des solutions magiques aux gens qui sont suffisamment ignorants et déséquilibrés.

(II) *Religion*. — Certains textes sont d'un ordre plus élevé, et remplissent mieux la promesse du sous-titre. Ils sont malheureusement beaucoup

moins nombreux : l'Evangile de l'enfance, de Jacques; l'apocalypse de la Vierge; l'invention de la croix; l'histoire de la fondation de Ste. Sophie; un fragment sur les hérésies; une chorographie écclésiastique; des propriétés théosophiques; une histoire de la naissance et de l'éducation de MAHOMET. Tous ces textes, qui sont comme on le voit assez variés, couvrent un peu moins de cent pages. Il ne peut-être question de les discuter ici, mais je les signale aux historiens des religions.

(III) *Physiologos*. — L'auteur édite deux Mss. du XVIIe siècle. Le no. 1008 de la Bibliothèque nationale, dont le contenu est tout à fait différent du Physiologos ancien ou byzantin que nous connaissons (voir mon *Introduction*, vol. 1, 300). L'esprit en est plus objectif, plus scientifique, moins moralisateur, moins religieux. Ce texte est assez long, une trentaine de pages. L'autre, le Parisinus suppl. gr. 223, était originellement plus long encore, mais il n'en reste qu'une petite partie (10 p. de cette édition.)

L'ouvrage est complété par un glossaire assez volumineux (p. 657-736). J'aurais aimé une liste séparée des noms de personnes. Voici ceux mentionnés dans les titres : Onirocrite de BLAISE L'ATHÉNIEN, Testament de SALOMON (trois fois), Onirocrite de MANUEL PALÉOLOGUE.

L'auteur, ancien membre de l'Ecole française d'Athènes, a publié précédemment des Etudes sur la magie grecque dans le *Bulletin de correspondance hellénique* (vols. 37 et 38) et le *Musée Belge* (vols. 17, 18, 26); des Etudes sur la littérature pythagoricienne (Paris, 1915); un Essai sur la politique pythagoricienne (Liége, 1922); La vie de PYTHAGORE de DIOGÈNE LAËRCE (Bruxelles, 1922); le vol. 10 du Catalogus codicum astrologorum greacorum, Cod. Athenienses (Bruxelles, 1924), et Les manuscrits à miniatures d'Athènes (Liége, 1926).

GEORGE SARTON.

Obed Simon Johnson. — *A Study of Chinese Alchemy*. XII + 156 pages. The Commercial Press, Shanghai, 1928.

A close study of Chinese alchemy is an urgent desideratum, but the present book unfortunately does not fill this want. To one who is not acquainted with the subject it may be recommended as a first aid provided he does not take it too seriously. The book lacks depth, viewpoint, method and criticism. It hardly contains any new facts, no clear exposition of Chinese alchemy, a heavy excess baggage of irrelevant matter, and a strong dose of unsound speculations. The first two chapters on Taoism and the changing concept of early Taoist teaching bear no direct relation to the subject, and are chiefly a compilation from second-hand sources. They are intended to produce the impression as though alchemy had naturally grown out of the soil of Taoism. This is the author's first fundamental error. Alchemy, in fact, is an entirely foreign element

in Chinese thought and suddenly shoots up in the second century B.C. under the emperor Wu when China was actually flooded by an invasion of influences rushing on from the West. If Mr. Johnson will read Maspero's critical work *La Chine antique*, he will probably modify his untenable thesis that alchemy had its origin in China and spread from there to the West. Taoism is not a religious unit, but a syncretistic system that has absorbed all sorts of extraneous elements, among these also the alchemy of the West; in primeval Taoism there is not a trace of alchemy.

The most disconcerting blunder of the book, however, is the intimation that the Chinese alchemist's object in transmuting base metals into gold was dictated by a desire for riches and for a life of comfort and ease. « The desire for gold being a universal phenomenon, it is reasonable to believe that, apart from the matter of personal avarice, popular demand was a most potent incentive in the search for gold through the process of transmutation » (p. 70). I doubt that any more unreasonable statement in regard to the Chinese could be found. In the first place, they cannot be accused of having ever been obsessed by the thirst for gold, nor is gold a synonym for riches in China, as the author boldly but wrongly asserts. There is not even a plain word for gold in the Chinese language; gold is only known as the « yellow metal ». The metal earliest known to the Chinese was silver, and next to it copper. Silver and copper, but never gold, formed the currency of China. In the second place, China is so rich in gold, and gold is so easily obtained from the sand of her rivers that it is the utmost absurdity to suggest that the alchemists expended their efforts on making gold artificially just for the fun of making money. They did so because they believed that gold produced by the processes of alchemical sublimation and transmutation was endowed with a superior vitality and efficacy in the endeavor to reach salvation and immortality; it was not gold as a metal they craved, but gold of a transcendental quality that would promote the spiritualization of the body. The term *yün-mu* does not mean « mother-of-pearl » (p. 87), but « mica, » which has played an extensive role in Chinese burial practice.

The stale legends concerning the introduction of Buddhism into China are reiterated (p. 90) without any knowledge of Francke's and Maspero's critical work which long ago exploded the native traditions. Modern sinological science is entirely foreign to the author. Nothing is said about the alchemy of India and its relation to that of China. Ray's *History of Hindu Chemistry* marches in the parade of the Bibliography, but is not made use of by the author. The important studies in Arabic alchemy published by Wiedemann and his school are unknown to him.

The preface mentions a photostat copy of a valuable work in the Library of Congress on Chinese alchemy, listed on p. 134 and described in three

sentences from a review of the work by the Chinese assistant in the Library of Congress. In the index, this is referred to as a « descriptive account. » In the body of the text just a single quotation from this work consisting of three sentences is given. What we need in the present state of science are complete translations or at least critical digests of Chinese books of alchemy; what we need are profound research, hard and intensive work, not talk, theories and speculations dressed up in a smiling book.

The bibliography offers a great surprise. It gives the titles of numerous works which contain nothing about alchemy, while important treatises on the subject are omitted. A useless book like BALL's *Chinese and Sumerian* is cited. PELLIOT's name is printed on p. 140, but not one title of his numerous works is listed. The author's work shows plainly how little familiar he is with the literature arrayed by him. On p. 134 he asserts that the *Shen sien chuan* has not been translated, while on p. 137 he quotes DE HARLEZ, *Le livre des esprits et des immortels*, which in fact is a translation of the Chinese work in question. The *Ts'an t'ung ki* is described « as the oldest complete work dealing with Chinese alchemy. » WYLIE's (*Notes on Chinese Literature*, p. 218) correct judgment that this book and its doctrine « have been by common consent discarded by the literati » is simply disregarded. The *Po wu chi* is not « a treatise on natural science, » but a collection of mirabilia and much fictitious matter. Instead of T'ung-fang Shu on p. 133 read TUNG-FANG SO. The work of HUAI NAN-TSE, « of which there is no translation, » has in part been translated into Russian by IVANOV. WIEGER's *Le Canon taoiste* is inserted in the Bibliography, but apparently not utilized; it contains a long list of alchemical books which if the author had studied them would have greatly increased the value of his production. Let us hope that he will continue his studies and give us something better in the future.

Chicago. B. LAUFER.

Florian Cajori. — *A history of mathematical notations.* Two volumes. Vol. 1 : Notation in elementary mathematics. XVI + 451 p. 106 fig., Chicago, Open Court Publishing Co., 1928. ($ 6).

Historians of mathematics have anticipated so long the publication of this great work, that a review of it may seen almost superfluous. Indeed it is the kind of book of which it would almost suffice to say : « Here it is ! Know you all that it has finally appeared. » But I bear in mind that many of our readers are less experienced, and for their sake — they who will succeed us and continue our task — it is necessary to give more information.

The author's introduction is so short, that we may allow him to state his purpose with his own words :

« In this history it has been an aim to give not only the first appearance of a

symbol and its origin (whenever possible), but also to indicate the competition encountered and the spread of the symbol among writers in different countries. It is the latter part of our program which has given bulk to this history. The rise of certain symbols, their day of popularity, and their eventual decline constitute in many cases an interesting story. Our endeavor has been to do justice to obsolete and obsolescent notations, as well as to those which have survived and enjoy the favor of mathematicians of the present moment. If the object of this history of notations were simply to present an array of facts, more or less interesting to some students of mathematics — if, in other words, this undertaking had no ulterior motive — then indeed the wisdom of preparing and publishing so large a book might be questioned. But the author believes that this history constitutes a mirror of past and present conditions in mathematics which can be made to bear on the notational problems now confronting mathematics. The successes and failures of the past will contribute to a more speedy solution of the notational problems of the present time. »

This first volume deals with elementary mathematics : Arithmetic and Algebra (400 p.) and Geometry (31 p.). This disproportion (31 p. vs. 400) is curious. We must assume that it is not at all due to the author, but to the subject itself; but this makes it all the more astonishing. What could be the explanation? Perhaps that geometry required symbols only when it became theoretical whereas the need of arithmetical symbols was obvious just as soon as the abacus stage was passed. Arithmetical symbols paved the way for the algebraical ones, while the geometrical need remained unheeded. And yet geometry developed far earlier than arithmetic... This suggests at once another puzzle. How is it that the Greeks who gave proof of so much mathematical genius, showed so little invention in the field of notation? Perhaps, because in their days writing was still uncommon, and most mathematical thinking pure headwork? I quote these puzzles to evidence the great psychological interest of these austere investigations.

To return to CAJORI's book, a first section (70 p.) is devoted to the « Numeral symbols and combination of symbols. » The author passes in review all the ancient civilizations : Babylonians, Egyptians, Phœnicians and Syrians, Hebrews, Greeks, early Arabs, Romans, Peruvians and North Americans Aztecs, Maya, Chinese and Japanese, and discusses the development of Hindu-Arabic numerals. The problems raised by these numerals are extremely important, not only because of their ubiquity, but also because they may serve to illustrate the whole subject of notation from its most concrete to its most abstract standpoint.

After this comes a very elaborate analysis of the arithmetical and algebraical symbols, used by individual authors : DIOPHANTOS, BRAHMAGUPTA, the author of the *Bakshâlî Ms.*, BHÂSKARA, etc., down to the beginning of the eighteenth century. This final period is aptly represented by two editorial communications extracted from the *Acta eruditorum* (Leipzig, 1708, p. 271) and from the *Miscellanea berolinensia* (1710, 155).

Both editorials recommend the use of a system of notations which might be called the Leibnizian (in fact, the second was written by LEIBNIZ himself). It is strange, by the way, that a study of LEIBNIZ's elementary notations was not included in this volume. The reason of this gap is that the author intends to deal with LEIBNIZ in vol. 2; this is well enough for the readers owning both volumes, but is hardly fair to those who do not otherwise need the second volume. Let us hope however that these one volume readers will be a small minority. My only other criticism (and it is a minor one) is that the various authors have not been placed in a stricter chronological order. Why place AL-KHWÂRIZMÎ after BHÂSKARA, LEONARDO OF PISA after PLANUDES, PIETRO BORGI after ESTIENNE DE LA ROCHE, etc.? This does not matter so much, if the reader is aware of it and replaces mentally these paragraphs in their proper succession. To show the complexity of the subject, of which present-day mathematicians are blessedly unconscious, « there were at the close of the sixteenth century twenty-five or more varieties of symbols for the calculus of radicals with which the student had to be familiar, if he desired to survey the publications of his time. » The main heroes of this long account, outside of LEIBNIZ — who remains hidden behind the veil — were the two Englishmen, WILLIAM OUGHTRED, whose *Clavis mathematicae* was first published in 1631, and JOHN WALLIS, whose *Arithmetica infinitorum* appeared twenty-four years later. That OUGHTRED thoroughly understood the implications of the subject, is clear from the following quotation (Circles of Proportion, 1632, p. 20).

« This manner of setting downe theoremes, whether they be Proportions, or Equations, by Symboles or notes of words, is most excellent, artificiall, and doctrinall. Wherefore I earnestly exhort every one, that desireth though but to looke into these noble Sciences Mathematicall, to accustome themselves unto it : and indeede it is easie, being most agreable to reason, yea even to sence. And out of this working may many singular consectaries be drawne : which without this would, it may be, for ever lye hid. »

This long analysis is followed by a rearrangement in topical order of all the material thus far obtained. I quote the titles of each section and for the sake of illustration, I also mention the subsections of the first section.

Signs of addition and substraction (divided as follows : Early symbols; origin and meaning of the signs; spread of the + and — symbols; shapes of the + sign; varieties of — signs; symbols for « plus or minus »; certain other specialized uses of + and —; four unusual signs; composition of ratios). Signs of multiplication. Signs of division and ratio. Signs of proportion. Signs of equality. Signs of common fractions. Signs of decimal fractions. Signs of powers. Signs for roots. Signs for unknown numbers. Signs of aggregation.

As already remarked, the geometrical section is considerably shorter. It is classified in the following order : A. Ordinary elementary geometry. Early use of pictographs; signs for angles; signs for « perpendicular »; signs for triangle, square, rectangle, parallelogram; the square as an operator; sign for circle; signs for parallel line; signs for equal and parallel; signs for arcs of circles ; other pictographs; signs for similarity and congruence; sign for equivalence; lettering of geometric figures; sign for spherical excess; symbols in the statement of theorems; signs for incommensurables; unusual ideographs in elementary geometry; algebraic symbols in elementary geometry. B. Past struggles between symbolists and rhetoricians in elementary geometry.

My analysis of CAJORI's great work, however long, can hardly give an adequate idea of the abundance of material which has been so thoroughly worked out by him. I must add that a large number (106) of well chosen facsimiles will enable the reader to see some of the fundamental documents with his own eyes. One of the concluding paragraphs may still be quoted, if only to prove that these minute investigations have not deadened the author's soul :

« The experience of the past certainly points to conservatism in the use of symbols in elementary instruction. In our second volume we indicate more fully that the same conclusion applies to higher fields. Individual workers who in elementary fields proposed to express practically everything in ideographic form have been overruled. It is a question to be settled not by any one individual, but by large groups or by representatives of large groups. The problem requires a consensus of opinion, the wisdom of many minds. That wisdom discloses itself in the history of the science. The judgment of the past calls for moderation. »

The main lesson which this book teaches is the slowness and timidity of human advance. One can take a horse to a trough, but not make him drink. A man of genius may invent a new device the adoption of which would save an infinite amount of energy — Hindu numerals, decimal notation, metric system, etc. — but nobody can oblige mankind to use that device. In fact history shows that the adoption was in almost every case extremely slow : it took centuries to introduce the Hindu numerals into Europe, and these notations are not yet entirely unified; the metric system of which SIMON STEVIN had guessed the principle as early as 1585, (*Isis*, 7, 543), is not yet understood by a vast portion of the civilized world of to-day !

To complete this review, I wish to pay a full tribute to the enlightened generosity of the Open Court Company, which has not hesitated to publish a book, so difficult to print, and to publish it in such a handsome way. I believe that no American publishers, — not even the University Presses, have shown as much disinterestedness and devotion to science as the Open Court Company. American scholars owe a deep debt of

gratitude to the HEGELER family, to the much lamented PAUL CARUS, and to his widow Mrs. MARY HEGELER CARUS. The richer and more powerful publishers become, the more commercial and greedy they tend to be; they have to think of their enormous overhead expenses, of their shareholders, etc. It is true of them, as it often is of individuals, that increased wealth makes generosity more difficult. The Open Court Company has shown another and better way; it cannot be honored too much.

GEORGE SARTON.

Erik Nordenskiöld. ***The history of biology.*** Translated from the Swedish by LEONARD BUCKNALL EYRE. With many portraits. XII + 629 + XV p. New York, KNOPF, 1928 (six dollars).

The publication of the English translation of this great work is very welcome, and we are especially anxious to devote to it the full review it deserves, because we failed to review the original Swedish edition, *Biologins Historia* (3 vols., Stockholm, 1920-24) and the German translation, *Die Geschichte der Biologie* (XIII + 648 p., Jena, 1926).

Thus far, strangely enough, we had only one history of biology worthy of the name, that is RÁDL's *Geschichte der biologischen Theorien* of which two very different editions appeared, the first in 1905-1909, the second in 1913. EMANUEL RÁDL is a Czech physiologist, who is now professor of « Naturphilosophie » in the Karlova Universita of Prague. His history is very elaborate, well documented and well written, but far too subjective, especially in the second edition. It is dominated by the author's curious philosophical views — a combination of vitalism, anti-Darwinism, and romanticism in the style of the old German « Naturphilosophie », together with an increasing distrust of objective science and with an enthusiastic admiration of ARISTOTLE, PARACELSUS, and DOSTOIEVSKY ! Such a work is certainly stimulative, though the author does but too often overreach himself, and I wonder how many readers have the patience to follow him to the end, unless they happen to share his peculiarities. Whichever the merit or demerit of RÁDL's « realistic cosmic view », one thing cannot be denied, his history lacks objectivity. It is less a history, than a philosophical discussion of evolving biology.

To return to NORDENSKIÖLD, his account is far superior in almost every respect, and it has the fundamental quality of objectivity. That is, the author has made throughout an earnest effort to be as objective as it is possible to be. For example, he is himself anti-Darwinian, and seems to favor a sort of compromise theory (« a mutational Lamarckism »), yet his discussion of that great subject is entirely fair, — which does not mean that it will satisfy everybody.

The first question I ask myself about a work of encyclopaedic proportion is « How is it built ? » It is clear that it is impossible to examine every

detail of it, but we can appraise its general plan. Now out of 614 pages, 65 are devoted to antiquity, 14 to the Middle Ages, 39 to the Renaissance, 180 to the seventeenth and eighteenth century, and 316 (half of the work) to the nineteenth century. These proportions are not bad, but a further examination reveals architectural defects, one of which at least is very serious. The account of the Middle Ages is utterly insufficient, but we can hardly blame the author for this, especially if one remembers that his work was first published in 1920-24, and has not been revised since. The account of pre-Homeric science is even less satisfactory, but again this is more or less excusable in our present state of knowledge and if one considers that the author is a zoologist, not an archaeologist.

But there is one thing that I cannot forgive as easily, that is the treatment of the seventeenth and eighteenth centuries, as if these two centuries constituted but one homogeneous period. This is, I believe, a capital error. That section is preceded by a philosophical introduction which carries us rapidly from DESCARTES to VOLTAIRE, then we are thrown back again into the Renaissance, so that PARACELSUS is discussed after VOLTAIRE ; NORDENSKIÖLD exaggerates the importance of the latter, and forgets to speak of the « Encyclopaedists », whose activity influenced the scientific world more deeply. As an instance of that influence, I may recall JACQUES LOEB's genuine admiration of them, an admiration which he expressed to me at least twice. There was as deep a difference between the seventeenth and eighteenth centuries as between the eighteenth and nineteenth. Mixing them, as the author does, is confusing to any reader, — and how terrible it must be for biologists, their name is legion, whose historical background is a little shaky ! They are continually thrown from the sixteenth century into the eighteenth or nineteenth and back again. I have already given an example of such laxity, PARACELSUS following VOLTAIRE, but there are many others and worse ones. DIOSCORIDES appears only on p. 191, after VOLTAIRE, and so does OTTO BRUNFELS. We leave VOLTAIRE on p. 130, to meet BUFFON only on p. 219. Apropos of this, I was well pleased to see the author's fair judgment of him. After being too much admired, poor BUFFON has been unjustly despised (see *Isis*, 9, 446); it was time to rehabilitate him. On the other hand, RÉAUMUR deserved to be treated more elaborately, for he was also one of the very greatest biologists of his time.

But I must quote other examples of chronological laxity, because this is the main defect of an otherwise excellent work. Moreover, this is the main defect of most books dealing with the history of science; and I have promised myself to denounce it as vigorously as I can on every opportunity, because we shall not have a sound knowledge of the development of science until that essential defect is eradicated. What would we think of a statistician who would get mixed up in his figures

and quote heterogenous data promiscuously? What would we think of a zoologist who would quote different kinds of animals promiscuously, and give the impression that they all belong to the same group? We must think the same of historians whose chronology is confused.

To illustrate the author's laxity in this respect, consider the following sentence, which precedes a statement of COMTE's positive philosophy. The author speaks of the influence exerted by the progress of physics and chemistry :

« And the results that these sciences achieved were very clearly brought home to the world in general, owing to their splendid application to practical life, which was then just beginning and which afterwards represented perhaps the most striking characteristic feature of the century; it was then that the influence of steam-power on industry and communications first began to be realized; it was then that the significance of chemistry in numberless fields of activity began to make itself felt in the daily life of humanity, not to speak of the somewhat later application of electrical phenomena in practical every day life. »

Now the « somewhat later » means at least half a century — half of the nineteenth century ! — for electricity did not really influence practical life until the last quarter of the century. The steam engines were pre-Darwinian, the whole industrial revolution was pre-Darwinian, but practical electricity (except telegraphy) was post-Darwinian (I mean, of course, post-1859).

Other example : the account of MENDEL's work follows that of W. L. JOHANNSEN's, though the latter was still a child when MENDEL published his first paper, in 1865 (1866). The date of that paper is not mentioned (the bibliography at the end only quotes a reprint of it, 1913), and the student is given no inkling of it; in fact, if he did not notice MENDEL's birthdate, he would easily be led to imagine that MENDEL followed JOHANNSEN. You see how chronological laxity inevitably creates historical distortions. One can not repeat it too often : chronology is the backbone of history; leave it out, and your narrative falls to pieces.

I have already praised the author's objectivity with regard to conflicting theories; his objectivity with regard to nationalities is no less remarkable. In this he was undoubtedly helped by his own nationality, for it is a good deal easier for a Scandinavian, than for, say, a Frenchman or a German, to appraise impartially the competitive activities of French and German biologists. Yet I have many reasons to believe that his sources were preponderantly German. Do you wish to know what this Scandinavian has to say of CESALPINO?

« His (CESALPINO's) ponderous and involved presentation of his case — vague, too, in comparison with SERVET's brief and explicit style — has enabled his admirers to interpret his statements as it suits their

purposes, but just as none of his contemporaries saw in him one who had revolutionized knowledge of the vascular system — a fact which he himself, Catholic and papal favourite as he was, would hardly have dared to admit — so there must in truth be a partisan and chauvinistic spirit in those of posterity who would ascribe to him the honour of an idea which he himself neither clearly expressed nor ever definitely claimed. »

I shall now indicate a few points which have attracted my attention. The accounts given of CLAUDE PERRAULT and STENO are good, and the discussion of the views of HOFFMANN, STAHL, and BOERHAAVE excellent. I also liked the chapter devoted to GOETHE, and the vindication of GALL. But it is shocking to see that only two pages are given to CLAUDE BERNARD against twenty three to HAECKEL ! BERNARD's very original studies on the physiological action of various poisons are just mentioned, and that mention is so vague that it is useless. The account of GALTON is equally insufficient, and it is clear that the author has hardly understood the importance of biometry; I hasten to add that this is the only great question that I can think of, which has been almost entirely neglected by him. Practically nothing is said of eugenics, which I think is a mistake, but one more defendable. A history of biological theories may omit applications, such as eugenics; there is no excuse for neglecting the statistical or biometrical point of view.

Most biologists will turn at once to the second half of the book dealing with the nineteenth century, and their criticism will vary exceedingly from one man to another according to the special studies of each. It is not possible to write a complete history of the nineteenth century; it is necessary to make a selection, and a very severe one at that. No two scientists could entirely agree on the same selection. The author fully realized the difficulties of his task, as the following extract will show :

« Undoubtedly the greatest service to biology that has been performed by modern cell-research, is its having given us our present knowledge of the course and significance of fertilization — a discovery worthy to be placed by the side of the explanation of the circulation of the blood in the seventeenth century. If, however, we compare the course of these two great achievements in the field of research, we get a striking impression of the contrast that exists between scientific activities nowadays and those of a couple of centuries ago. On the one hand, HARVEY, who spent twenty years or so quietly and peacefully examining the idea that had been kindled in him in his youth, and who afterwards submits it to the world in its perfect and consummate form. On the other hand, a number of scientists of today, some of them admittedly of the highest rank, working all at the same time in mutual rivalry at the problem of fertilization, expound their results practically every year, often in a half-

finished state and sadly in need of emendation, and then disputing each others' claim to the honour of having produced the various details of the discovery, each one seeking to interpret according to his own lights statements that are often found to have been originally formulated as mere assumptions and suggestions. The account of how our knowledge of the origin of individual life was finally acquired can therefore hardly be so attractive a task as that of describing HARVEY's lifework. »

Imperfect as it is, NORDENSKIÖLD's work marks a considerable advance. Thanks to him, it will now be possible to teach the history of biology with relative ease, and to refer students to intelligent and comprehensive discussions of the main problems. Every biologist or physician reading this book will obtain not only a good idea of the development of biology, but at once a good philosophical introduction to his studies. Every teacher of biology ought to read it.

Some day we shall have, I hope, a better book. May be the author himself will give it to us? But in the meanwhile, his present book is the best history of biology available in any language; and the only one — I mean, the only philosophical one — available in English.

GEORGE SARTON.

Edward Heron-Allen. — *Barnacles in nature and in myth.* XV + 180 p., 53 fig. Oxford University Press, 1928 (15 s.).

This delightful volume is divided into three parts of which the first gives the natural history of *Lepas anatifera* and *Balanus balanoides*, « the pedunculate or stalked species thrown up on our shores adherent to logs of driftwood, and the sessile species growing upon our rocks, and so deleterious to bathers and the bottoms of ships. » The second part deals with the myth relative to *Lepas anatifera*, myth which the very name records, for *anatifera* means goose-bearer. (It is also recorded by the name *bernicla* for the goose in the genus *Anser*). The author has taken considerable pains to trace the history of that myth. The first authoritative statement of it was given by ALEXANDER NECKAM or by GERALD THE WELSHMAN, both of whom flourished in the second half of the twelfth century; but the myth had already been mentioned before that by PIETRO DAMIANI, cardinal bishop of Ostia (eleventh century). The third part is devoted to the study of several representations of what might be called « barnaculized geese » upon Mycenaean pottery. The late FREDERIC HOUSSAY (*Isis*, 7, 433-55) was the first to draw attention to this in the *Revue archéologique*, 1895, and the study of that fascinating subject was continued by Sir RAY LANKESTER in his *Diversions of a naturalist* (London, 1915). This carries the barnacle myth back to Mycenaean times. Nothing unplausible in this, but how was the myth transmitted to us, how did it bridge the enormous gap between the ninth

century B.C. and the eleventh century after Christ? The mystery is increased by the fact that the myth occurs neither in Greek nor in Roman lore.

This book is admirably illustrated, and contains abundant notes, but unfortunately these are printed behind the text, making reference to them very tiring. According to his own admission the author has « an ineradicable passion for verifying references and a hobby for footnotes amounting to mania »; how then did he ever allow them to be printed in such inconvenient way that most of them are bound to remain unread?

GEORGE SARTON.

Edwin Tenney Brewster. — *This puzzling planet.* The earth's unfinished story; how men have read it in the past, and how the wayfarer may read it now. 328 p., illustrated. Indianapolis, BOBBS-MERRILL Co., 1928. ($4).

The author needs no introduction to our readers, for two excellent books of his are already well known to them (or ought to be), his *Understanding of Religion* (Boston, 1923) and his *Creation.* A history of non-evolutionary theories (Indianapolis, 1927), both of which were fully reviewed in *Isis* (vol. 7, 162-65; vol. 9, 462-65). The present volume, which deals with geology, is fully as good as its two predecessors. It deserves to arrest our attention, because the author never neglects the historical aspects of his subject. And through his historical knowledge is sometimes deficient, I like his books because of their scientific soundness.

I have often said, but it bears repeating, that the difficulty of the history of science is due to the fact that it is, as its name indicates, a combination of history and of science. The complete historian of science must have a deep understanding of science and be a good historian. Such combination of knowledge and aptitude is necessarily rare, and we must be satisfied, as usual, with something more or less remote from our ideal, and take historians of science as they are. However, and this is my main point, historical shortcomings are on the whole far less dangerous than the purely scientific ones. A sound comprehension of the subject is the very heart of our studies, for what interest could we have in the history of a scientific idea, however accurate, if the idea itself was misconstrued? Of the two kinds of historians of science, those who were primarily trained as historians, and those who received a purely scientific training, we may assume a priori that the latter are the better.

« This Puzzling Planet » is an attempt, and on the whole a very successful one, to explain the main theories of modern geology in as simple a language as possible. An introductory chapter « Shepherd against sailor » shows why geology was born in Greece, and not in Palestine

or in Mesopotomia; the reasons of this were not simply psychological, but geological. Greece was a country which invited geological speculation, while the alluvial plains of Mesopotamia discouraged it. The titles of the following chapters are sufficiently clear, for him who knows, to require further comment.

(2) This North America of ours; (3) The geology of common sense; (4) The flood theory of fossils; (5) The onion-coat earth; (6) The divisions of geologic time; (7) Where the fossils come in; (8) What is inside the earth; (9) The lesson of the earthquake wave; (10) Continents adrift; (11) Faults, earthquakes, and rift valleys; (12) The making of mountains; (13) Faults and folds; (14) The carving of the landscape; (15) Ice-ages, old and new; (16) The chronology of an ice age; (17) The climates of geologic time; (18) Life without fossils; (19) The beginnings of the world.

The intelligent reader who will take the trouble to peruse this book carefully (for being a worthwhile book it cannot be read without effort) will have a very good introductory knowledge of the development of geology and of its main problems : glacial theory, WEGENER theory, isostasy, tectonics, seismology, absolute chronology, palaeogeography and palaeoclimatology, etc., etc. To give a more concrete idea of it, I shall quote a few passages which struck me as particularly felicitous.

It was a good idea to insist that the palaeontological method of determining the relative chronology of strata was considerably anterior to the theory of evolution. It is well to remember that « of the four main lines of evidence for evolution in the animal kingdom, three were supplied with convincing data by persons who did not accept the theory. »

What makes an Ice Age is not cold winters, but cool summers. « There is no reason to suppose that the earth's average temperature during the last great Ice Age was more than about ten degrees colder than it is now. Ten degrees mean annual temperature is the difference between Sitka and Portland on one side of the continent, Cape Cod and Cape Hatteras on the other, Missouri and Louisiana in between. Not cold, but heavy snowfall, makes an Ice Age. A drop of three degrees would probably put back the glaciers of northern Scotland. » « The earth as a whole is growing neither cold nor hot. It simply alters back and forth, as from summer to winter and day to night, without really getting anywhere. Climatic change, also, exhibits ' no trace of a beginning and no prospect of an end.' (*) That, too, is 'uniform.' »

The account of seismology is good too, though it would have deserved more development. In this and all related questions, the author has followed REGINALD ALDWORTH DALY of Harvard (*Isis*, 10, 286), — a safe guide. The making of mountains is clearly explained, and a fair

(*) See *Isis*, 2, 360, pl. 2.

tribute is paid to the main pioneer of these studies, PETER SIMON PALLAS. « The important point is that all the great ranges of the world, and most of the small ones as well, have been compressed from side to side. » « The thrust that makes the mountain range comes from one side only, not from both — from the south for the Alps and Himalayas; from the southeast for the Appalachians. » « It all looks very much as if the Pacific Basin were a low spot on the earth; and all the land on earth were sliding down into it from all sides. »

To illustrate the newness of scientific geology, BREWSTER recalls an amusing anecdote relative to ADAM SEDGWICK's election to the Woodward chair in Cambridge, 1818 (mark the date, 1818) : « So SEDGWICK became a candidate — against a large field, for the Woodwardian Professorship at Cambridge was even then an academic prize. He won hands down, being obviously by far the best qualified man. His nearest rival, as SEDGWICK said',... had not the slightest chance against me, for I knew absolutely nothing of geology, whereas he knew a good deal — but it was all wrong.' »

In the course of my reading I came across a few historical errors, which ought to be corrected in future editions. The tenth century Muslim, 'UMAR AL-'ALIM (p. 50, 55), which the author found in LYELL's *Principles*, is, I believe, a ghost; if not, he did not live as early as LYELL says (See my *Query* 12, in this journal). HORACE BENEDICT DE SAUSSURE was not the first man, but the third, to ascend Mont Blanc. The first ascent was made by PIERRE BALMAT and MICHEL GABRIEL PACCARD on August 8, 1786; SAUSSURE's ascent occurred on August 3, 1787 (*Isis*, 6, 67). It is not correct to say that the first geological map was made by WILLIAM SMITH in 1799, and the first geological map of America, by WILLIAM MACLURE in 1809; or at any rate these statements would need qualification. I have given in 1919 a list of early geological maps, including 9 anterior to WILLIAM SMITH. (*Isis*, 2, 369-371).

GEORGE SARTON.

Lucien Lévy Bruhl. — *Les fonctions mentales chez les sociétés inférieures.* 8e éd. (111 + 370 p.). Bibliothèque de philosophie contemporaine. Paris, FELIX ALCAN. 1929 (frs. 40)

Raoul Allier. — *Les non-civilisés et nous, différence irréductible ou identité foncière.* 317 p. Paris, PAYOT, 1927 (frs. 25).

Olivier Leroy. — *La raison primitive.* Essai de réfutation du prélogisme. 316 p., 8 fig., 15 pl. Paris, GEUTHNER, 1927 (frs. 60).

La notoriété de l'œuvre de M. LÉVY BRUHL concernant la psychologie intellectuelle des peuplades improprement appelées sauvages ou primitives a dépassé largement le cercle restreint de spécialistes auxquels elle semblait tout d'abord adressée; elle n'intéresse plus seulement les ethnologues, les voyageurs et les fonctionnaires coloniaux; mais elle

est aussi utilisée et commentée à diverses occasions par les psychiatres, les pédagogues, les sociologues, les historiens, et les philosophes soucieux d'établir sur des bases solides la théorie de la connaissance scientifique. A ce titre elle ne saurait laisser indifférents les lecteurs d'*Isis* qui se souviennent de ses deux derniers ouvrages : *La mentalité primitive* (*Isis* 5, 467) et *L'âme primitive* (*Isis* 9, 482). La librairie FÉLIX ALCAN vient de rééditer le premier livre dans lequel l'auteur a abordé le sujet sur lequel il n'a pas cessé depuis de méditer : *Les fonctions mentales dans les sociétés inférieures* (paru en 1912); cette nouvelle édition ne diffère des précédentes que par l'adjonction d'un excellent index qui avait manqué jusqu'alors.

La doctrine de M. LÉVY BRUHL qu'il nous faut examiner ici a sans doute pu paraître quelque peu paradoxale ; elle a cependant fini par s'imposer et cela avec une telle force que ses conclusions en ont semblé de l'aveu d'un ardent adversaire (LEROY, p. 13) définitivement acquises; ce grand succès même devait susciter nombres de critiques et d'objections. M. RAOUL ALLIER, dans un ouvrage intitulé : *Les non-civilisés et nous : différence irréductible ou identité foncière*, la combat avec mesure. M. OLIVIER LEROY a prononcé contre elle un sévère réquisitoire dans un livre d'ailleurs luxueusement présenté et orné de belles illustrations : *La raison primitive; essai de réfutation du prélogisme* (*Isis*, 11, p. 259).

A la lumière de cette controverse, il nous sera sans doute possible de faire un examen judicieux des théories de M. LÉVY BRUHL; d'indiquer peut être quels en sont les points douteux ou prétant à discussion; mais aussi de mettre en relief ce qu'elles apportent de nouveau et de fécond concernant la connaissance de la marche de la pensée humaine.

Si la lecture des livres de M. LÉVY BRUHL a pu faire naître dans l'esprit de beaucoup d'entre nous un malaise qui ne se dissipe que lentement, cela tient à ce qu'il a heurté de front et dans la manière même dont il a posé le problème initial, une affirmation instinctive, spontanée et tenace; le point de départ de ses travaux fut en effet un doute concernant l'unité de l'esprit humain, unité qui avait toujours été admise comme allant de soi et qui d'ailleurs forme la trame des déductions de Sir JAMES FRAZER dans cet admirable monument qu'est le *Rameau d'or*. Contrairement donc à une semblable hypothèse qui, répétons le, nous agrée naturellement par sa simplicité et sa vraisemblance, M. LÉVY BRUHL s'est demandé si la mentalité de certaines races d'hommes ne différait pas de la nôtre, (entendons de celle que nous croyons être la nôtre); il a cru pouvoir expliquer ainsi une foule de mœurs, de pratiques et de croyances étrangères qui avaient attiré l'attention étonnée des explorateurs et missionnaires fréquentant les peuplades sauvages; portant ses vues plus loin encore, il a tenté, en ramenant tous ces faits sous un point de vue unique, sinon de pénétrer entièrement la mentalité de ces hommes ap-

paremment si éloignés de nous, du moins de la deviner, de déterminer quelles sont ses réactions les plus caractéristiques.

Après une longue et minutieuse enquète, M. Lévy Bruhl a établi que la pensée des primitifs toute encombrée d'émotivité et de mysticisme, fort peu capable d'abstraction ou d'analyse désinteressée, ne supporte pas dans un nombre considérable de cas le joug de nos axiomes logiques fondamentaux, notamment du principe de contradiction ! Cette mentalité, que faute d'un terme meilleur, l'auteur qualifie de *prélogique*, différerait de la nôtre en ce que la plupart de ses démarches seraient régies par une *loi de participation* qui permettrait d'affirmer une identité simultanément partielle et complète entre évènements et choses apparemment fort différents qui seraient cependant les mêmes; pour cette mentalité, en effet, « les objets, les êtres, les phénomènes peuvent être d'une façon incompréhensible pour nous à la fois eux mêmes et autre chose qu'eux mêmes. D'une façon non moins incompréhensible, ils émettent et ils reçoivent des forces, des vertus, des qualités, des actions mystiques qui se font sentir hors d'eux sans cesser d'être où elles sont ». (p. 77).

Que cette proposition d'allure étrange explique une foule d'exemples pittoresques qui dans l'œuvre de M. Lévy Bruhl lui servent à la fois de soutien et d'illustration, c'est ce que nous révèlerait la lecture des *fonctions mentales chez les sociétés inférieures*; la place nous manque ici pour suivre l'auteur dans ses recherches concernant les diverses langues parlées par les primitifs, leurs systèmes de numération, leurs croyances, leurs pratiques, leurs mœurs; signalons simplement ceci : « L'enfant nouveau né subit le contre-coup de tout ce que fait son père, de ce qu'il mange, etc...L'Indien à la chasse ou à la guerre est heureux ou malheureux, selon que sa femme restée dans son campement s'abstient ou non de tels aliments, de tels ou tels actes. » (p. 78).

Il nous faut maintenant remarquer avec M. Raoul Allier que la proposition fondamentale de M. Lévy Bruhl est tantôt fort modestement présentée comme une simple hypothèse de travail, tantôt plus dogmatiquement comme une loi désormais hors de discussion. Or quelle portée devons nous lui attribuer ? Allons nous la rejeter entièrement en la déclarant arbitraire et artificielle ? C'est ce que les critiques que nous avons nommés se sont bien gardés de faire. N'allant pas au fond du débat, dédaignant (ce qu'il faut regretter) d'attaquer de front la doctrine qu'ils combattent, afin de découvrir dans l'argumentation de l'auteur quelque tare difficilement perceptible qui en aurait vicié les conclusions, ils se sont contentés, en éparpillant leurs efforts en tous sens, de lui livrer une guerre d'escarmouches; ils n'ont pas nié la valeur de la documentation, l'exactitude des faits qui ont servi à M. Lévy Bruhl de matériaux de construction; seulement, avec M. Olivier Leroy, ils

ont prétendu que l'enquête préliminaire avait été partielle et incomplète; menée avec une idée préconçue, cette enquête n'aurait pas présenté sous une lumière égale tous les traits de la vie, des mœurs et de la mentalité des sauvages; elle n'aurait signalé qu'une partie des ressources mises en jeu par le développement de la pensée primitive; en la contemplant entièrement, en n'oubliant pas une partie de ses richesses, l'on verrait, suivant les critiques, que la psychologie intellectuelle dans les sociétés dites inférieures, diffère beaucoup moins de la nôtre qu'il n'aurait semblé tout d'abord.

Qu'y a-t-il donc à retenir des diverses critiques adressées à M. LÉVY BRUHL ? Reconnaissons d'abord que le terme même de *primitif* — adopté sans idée préconçue par l'auteur et aujourd'hui d'usage courant — appelle dans l'esprit de maint lecteur une hypothèse évolutioniste, sans doute arbitraire, que M. OLIVIER LEROY dénonce expressement (p. 16 à 23) : d'après laquelle nos sauvages d'aujourd'hui auraient atteint un stade de développement tout à fait comparable à celui des ancêtres lointains de l'humanité civilisée actuelle. Il suffit, semble-t-il, de signaler qu'il n'y a là qu'une querelle de mots, pour dissiper au moins partiellement le malentendu qu'elle a fait naître.

Reconnaissons aussi que les nombreux exemples cités par M. LÉVY BRUHL à l'appui de sa thèse ont été en effet soigneusement choisis en vue de l'utilisation de leur force démonstrative; — mais demandera-t-on immédiatement, dans une œuvre semblable à la sienne aurait-il pu en être autrement ? Toujours est-il que contrairement à ce que l'on croit bien souvent, l'auteur des *fonctions mentales chez les sociétés inférieures* n'a pas prétendu décrire entièrement la vie et les mœurs des peuplades sauvages; après avoir lu ses ouvrages, l'on pourrait ignorer que la plupart des sorciers qui terrorisent les villages sont véritablement des êtres dangereux, puissants et malfaisants (LEROY, chap. V 117) l'on pourrait ignorer encore — je parle d'après M. LEROY (p. 147 et suiv.) — que la magie telle qu'elle est pratiquée chez les peuples nègres aboutit parfois à des divinations si surprenantes d'exactitude que bien des missionaires doués de sens critique aiguisé sont restés hésitants quant à la valeur des procédés employés.

Reconnaissons ensuite que M. LÉVY BRUHL a négligé de signaler les nombreux cas relevés par M. LEROY où les sauvages ont fait preuve d'une intelligence qui nous paraîtrait normale; cette omission — ajoutons le — a été volontaire, puisque ces dits exemples n'apportaient aucune lumière à la question primordiale qu'il s'était proposé de résoudre : Dans quels cas et comment la pensée des primitifs peut-elle s'engager dans des voies qui paraissent étrangères à celle que suit notre pensée logique ?

Reconnaissons enfin avec M. RAOUL ALLIER qu'il ne serait pas difficile de déceler chez les civilisés de nombreuses croyances, raisonnements

et pratiques basés sur l'admission souvent inconsciente de *participations prélogiques*. M. LÉVY BRUHL, il est vrai, a bien consacré quelques pages à la *persistance des éléments prélogiques* (p. 450, 454) dans notre mentalité; peut-être n'a t-il pas aperçu immédiatement que ces dits éléments constamment combattus et refoulés par la critique véritablement logique forment encore aujourd'hui un des ressorts les plus importants et les plus efficaces de notre pensée elle même.

En définitive, il nous faudra accorder à MM. LEROY et ALLIER qu'il n'existe aucun abîme infranchissable entre la pensée des primitifs et la nôtre; loin que ces mentalités soient foncièrement hétérogènes, elles ne diffèrent pour ainsi dire que de degrés; la notion instinctive de l'unité de l'Esprit humain n'a, semble-t-il, pas été atteinte par les travaux de M. LÉVY BRUHL; faudrait-il donc proclamer avec quelques polémistes que l'œuvre de ce dernier serait inutile et vaine? A notre avis une telle conclusion laisserait échapper l'essentiel de ce que le livre que nous analysons a apporté de nouveau. De même que les chimistes ont découvert l'hélium dans le soleil avant de le découvrir sur la terre, l'auteur en étudiant les sauvages a, par un détour long et inattendu, mis en lumière un effet constant des démarches de notre inteligence qui avait échappé jusqu'alors aux psychologues les plus perspicaces. Ainsi que l'avaient pressenti savants et philosophes mystiques qui ne sont, il faut le dire, jamais parvenus à s'expliquer clairement, la logique ne serait pas l'instrument de la pensée, mais, de la vérification; c'est parce que ce besoin de la vérification est très faible chez le primitif et qu'il ne masque pas chez lui le mouvement spontané de l'esprit, que M. LÉVY BRUHL a pu observer dans toute sa force le jeu de la *loi de participation*, que la réflexion critique ne tolère que péniblement; mais il serait possible de montrer que, quoique plus faiblement, cette même loi joue aussi ailleurs : l'étude de la formation des hypothèses scientifiques notamment nous révèlerait sans doute que le chercheur fait constamment effort pour échapper aux contradictions imposées par des *participations* inaperçues, dissimulées dans les prémisses; ainsi, en s'engageant dans la voie nouvelle ouverte par M. LÉVY BRUHL, l'historien des sciences pénétrerait avec plus de facilité et de sympathie dans les doctrines des savants anciens dont une partie des fondements lui avait paru au premier abord étranges ou inaccessibles.

(*Paris*) HÉLÈNE METZGER.

Twenty Fifth Critical Bibliography

of the

History and Philosophy of Science and of the History of Civilization

(*to October* 1928)

This Twenty Fifth Bibliography contains about 661 items, some of which have been kindly contributed by the following scholars :

T. L. DAVIS (Cambridge, Mass.)
L. GUINET (Brussels)
J. W. S. JOHNSSON (Copenhagen)
E. KREMERS (Madison, Wisc.)
H. METZGER (Paris)
J. NEEDHAM (Cambridge)
QUIDO VETTER (Prague)
H. WIELEITNER (Munich)
J. K. WRIGHT (New York)

This bibliography includes a complete analysis of volume 10, and the seventh series of addenda and errata to Volume I of my *Introduction to the History of Science* (Baltimore and London, 1927). An author's index will be found at the end.

Papers and books sent to the Editor are entered into this bibliography if they are relevant to its purpose. They may be the object of analytical notes or longer reviews, if this seems sufficiently necessary and the services of competent scholars are available. It is obvious that only a small number of publications can be adequately reviewed and that it is not even possible to give a brief description of each and every one. However, our classification is so comprehensive and so minute, that even if we do nothing but give the accurate title of an item and put it in its proper place, we are already rendering a real service to the author, the publisher and the learned public. It should also be noted that there is no relation between the importance of a publication and the length of the note devoted to it.

The ultimate aims of this undertaking are : (1) to establish the History of Science as an independent discipline; (2) to demonstrate inductively the Unity of Knowledge and the Unity of Mankind; (3) to serve as a center of information and rallying ground to the scholars engaged in our studies.

Harvard Library, Room 185.
Cambridge, Massachusetts.

GEORGE SARTON.
November 23, 1928.

PART I.

FUNDAMENTAL CLASSIFICATION (CENTURIAL).

Vth Century B. C.

Luria, S. PROTAGORAS und DEMOKRIT als Mathematiker. *Comptes Rendus de l'Académie des Sciences de l'URSS*, 74-79, 1928. ISIS

Meritt, Benjamin Dean. The Athenian calendar in the fifth century, based on a study of the detailed accounts of money borrowed by the Athenian state, I. G. I^2, 324. (Published for the American School of Classical Studies at Athens) 138 p., 2 pl. Cambridge, Harvard University Press, 1928. ISIS

Reviewed by A. B. W., *American Historical Review*, 34, 99-101, 1928.

IVth Century B. C. (whole and first half).

Körte, Alfred. Aufbau und Ziel von XENOPHONS Symposion. (*Ber. über d. Verh. der Sächs. Akad. der Wiss.* zu Leipzig, *Philol.-hist. Kl.*, 79. Bd.) 48 S. Leipzig, HIRZEL, 1927. ISIS

Reviewed by TH. HOPFNER, *Deutsche Literaturzeitung*, 1594-96, 1928.

Müller, Friedrich. Stilistische Untersuchung der Epinomis des PHILIPPOS VON OPUS. *Philolog. Dissert.* 73 p. Berlin, 1927. ISIS

Reviewed by GIORGIO PASQUALI, *Deutsche Literaturzeitung*, 1217-1218, 1928.

(Plato) *Introduction*, vol. I, p. 115. Add to the bibliography relative to the Nuptial Number the following. HERMANN VOLLRAT HILPRECHT : Mathematical, metrological, and chronological tablets from the Temple Library of Nippur (The Babylonian Expedition of the University of Pennsylvania, Series A, Cuneiform texts, vol. XX, 1. p. 29-34, Philadelphia 1906). QUIDO VETTER. ISIS

IVth Century B. C. (second half).

Suys, Emile. Vie de PÉTOSIRIS. Grand prêtre de THOT à Hermopolis la-Grande. Avec une préface de JEAN CAPART. 158 p., 6 pl. Bruxelles Edition de la Fondation Egyptologique Reine Elisabeth, 1927. ISIS

Compte rendu populaire fort bien écrit des découvertes de GUSTAVE LEFEBVRE publiées par lui dans son *Tombeau de Pétosiris* (3 vols.; Le Caire, 1923-24). G. S.

Vogliano, Achille. Nuove Lettere di EPICURO e dei suoi scolari. 41 p., 5 pl. Bologna, Stabilimenti poligrafici riuniti, 1928. ISIS

Reviewed by U. VON WILAMOWITZ-MOELLENDORFF, *Deutsche Literaturzeitung*, 1157-1158, 1928.

IIIrd Century B. C. (whole and first half).

Heath, Sir Thomas L. The thirteen books of EUCLID's Elements. Translated from the text of HEIBERG. With introduction and commentary. 3 vols. I. Introduction and Books I, II. XII + 432 p, 1 pl. Vol. II. Books III-IX 436 p. Vol. III. Books X-XIII and appendix. Cambridge University Press, 1926. (New York, MACMILAN). ISIS

Reviewed by GEORGE SARTON, *Isis*, 10, 60-2, 1928.

Thomas-Stanford, Charles. Early editions of EUCLID's Elements. 64 p., 13 pl., London, Bibliographical Society, 1926. ISIS

Reviewed by R. C. ARCHIBALD, *Isis*, 10, 60, 1928.

IIIrd Century B. C. (second half).

Miller, G. A. ARCHIMEDES and trigonometry. *Science*, 67, 555, 1928 ISIS

Miller, G. A. The so-called sieve of ERATOSTHENES. *Science*, 68, 273, 1928. ISIS

Mookerji, Radhakumud. ASOKA (Gaekwad Lectures). XV + 273 p. London, MACMILLAN, 1928. ISIS

Ist Century B. C. (whole and first half).

McLean, R. C. LUCRETIUS's anticipation of Mendelism. *Nature*, 121, 749, 1928. ISIS

Schubert, Paul. Die Eschatologie des POSIDONIUS. (*Veröff. der Forsch.-Inst. für vergl. Religionsgesch.* an der Univ. Leipzig,) 100 p. Leipzig, PFEIPPER, 1927. ISIS

Reviewed by I. HEINEMANN, *Deutsche Literaturzeitung*, 5, 1709-10, 1928.

Ist Century after Christ (second half).

Wilson, Thomas, of Stow. St. Paul and paganism. (The Gunning Lectures, 1926). VII + 285 p. Edinburgh, T. AND T. CLARK, 1927. ISIS

IInd Century (whole and first half).

Tallgren, Oiva Joh. Survivance arabo-romane du catalogue d'étoiles de PTOLÉMÉE. Etudes philologiques sur différents manuscrits. I.

Introduction et Série première. Extrait de *Studia Orientalia*, edidit Societas Orientalis Fennica, 2, 202-283, Helsingfors, 1928. ISIS

« Je me propose de comparer au texte grec de PTOLÉMÉE, pour une série de passages, d'abord, deux traductions arabes inédites et étudiées sur trois manuscrits, puis la traduction latine de GÉRARD DE CRÉMONE étudiée sur un manuscrit du XII[e] siècle et, en dernier lieu, la traduction espagnole d'ALPHONSE X étudiée, en partie, sur tous les manuscrits connus de son Astronomie. Une fois terminée, l'étude comparée de ces manuscrits inédits nous permettra d'établir la filiation d'un certain nombre de malentendus d'ordre linguistique dont se ressent la tradition médiévale du Catalogue d'étoiles de PTOLÉMÉE, et de rectifier notamment une série d'erreurs commises en l'espèce par LUDWIG IDELER. Un certain nombre des notes qui suivent pourront offrir quelque intérêt au point de vue de la science des traductions en général. Tous ces travaux sont destinés à préparer une édition du texte d'ALPHONSE X ainsi que de la partie correspondante de l'Almageste arabe et de la traduction de GÉRARD, si importante celle-ci au point de vue de l'histoire de la science européenne. En outre, le cas échéant, je parviendrai à introduire des corrections dans le texte grec de PTOLÉMÉE tel qu'il apparaît dans la soigneuse édition de HEIBERG. »

IInd Century (second half).

Bernhard, Max. Der Stil des APULEIUS von Madaura. Ein Beitrag zur Stilistik des Spätlateins. (*Tübing. Beiträge zur Altertumswiss*, 2.) XII + 366 p. Stuttgart, W. KOHLHAMMER, 1927. ISIS

Reviewed by WILHELM BAEHRENS, *Deutsche Literaturzeitung*, 1305-1307, 1928.

Robinson, Herbert Spencer. GALEN in CHAUCER, SHAKESPEARE, and JONSON. *Medical Life*, 35, 445-50, illustr. 1928. ISIS

Walsh, Joseph. GALEN clashes with the medical sects at Rome. *Medical Life*, 35, 408-43, illus., 1928. ISIS

IIIrd Century (second half)

Bréhier, Emile. La Philosophie de PLOTIN. XX + 190 p., BOIVIN, Paris, 1928. ISIS

EMILE BRÉHIER, à qui on doit une édition complète, avec traduction, des Ennéades (*v. infra*, PLOTIN), publie un cours fait à la Sorbonne en 1921-22, sur « ce que PLOTIN appelle d'un nom d'ensemble l'intelligible », sur l'Un, l'Intelligence, et l'Ame, qui constituent le « cœur de la pensée de PLOTIN. » — 1. Le troisième siècle de notre ère; 2. les Ennéades; 3. le problème fondamental de la philosophie de PLOTIN; 4. la procession; 5. l'Ame; 6. l'Intelligence; 7. l'orientalisme de PLOTIN; 8. l'Un; 9. Conclusion.

Plotin. Ennéades. IV. Texte établi et traduit par EMILE BRÉHIER. Collection des universités de France. 472 p., *Les Belles Lettres*, Paris, 1927. ISIS

Les deux premiers volumes de cette édition, ou les notes de BRÉHIER sont infiniment précieuses, ont été signalées au tome 7 de cette revue, p. 534. Celui-ci comprend tous les écrits de PLOTIN sur l'âme (*V. supra* : BRÉHIER). L. G.

Waldschmidt, Ernst; Lentz, Wolfgang. Die Stellung JESU im Manichäismus. (*Abhandl. der preuss. Ak. der Wiss.*, 1926, *Phil.-hist. Klasse*), 131 p., 4 pl. Berlin, 1926. ISIS

Reviewed by PAUL PELLIOT, *T'oung pao*, 25, 426-435, 1928.

IVth Century (whole and first half).

Eusebios, Bishop of Caesarea. The ecclesiastical history and the martyrs of Palestine. Translated with introduction and notes by H. J. LAWLOR and J. E. L. OULTON. Vol. II., introduction, notes and index. London, S. P. C. K., 1928. ISIS

IVth Century (second half).

Oribasios. Collectionum medicarum reliquiae. I, Libri I-VIII edidit J. RAEDER. (*Corpus medicorum Graecorum* VI, 1, 1) VIII + 300 p. Leipzig, TEUBNER, 1928. ISIS

Tucci, Giuseppe. Is the Nyayapravesa by DINNAGA? *Journal Royal Asiatic Society*, 7-13, 1928. ISIS

Tucci, Giuseppe. On the Fragments from DINNAGA. *Journal Royal Asiatic Society*, 377-390, 1928. ISIS

Vth Century (whole and first half).

(Pelagius). PELAGIUS's Expositions of thirteen epistles of ST. PAUL. Text and apparatus criticus by ALEXANDER SOUTER. (Texts and Studies, edited by J. A. ROBINSON, Vol. 9). 553 p. Cambridge, University Press, 1926. ISIS

Reviewed by ADOLF DEISSMANN, in *Deutsche Literaturzeitung*, 997-1000, 1928.

Vth Century (second half).

Gânguli, S. K. Notes on ÂRYABHAṬA. 1. ARYABHATA's rules for the extraction of square and cube roots; 2. ARYABHATA's value of pi; 3. ARYABHATA's inaccuracies; 4. ARYABHATA's solution of quadratic equations; 5. The Greek rule epanthema. Reprinted from the *Journal of the Bihar and Orissa Research Society*, 78-91, Patna, 1926. ISIS

Gânguli, Sâradâkânta. Was ÂRYABHAṬA indebted to the Greeks

for his alphabetic system of expressing numbers? *Bull. Calcutta Math. Soc.*, vol. 17, no. 4, 195-202, 1928. ISIS

« ĀRYABHAṬA's alphabetic scheme had an orderly growth in India. As a result of the application of the three tests laid down by Mr. KAYE, we are forced to the conclusion that ĀRYABHAṬA is not indebted to a foreign source for his alphabetic system of expressing numbers. »

VIth Century (second half)

Jones, Putnam Fennell. The Gregorian mission and English education. *Speculum*, 3, 335-348, 1928. ISIS

VIIth Century (whole and first half).

Nöldeke, Theodor. Geschichte des Qorâns. 2. Aufl. III. Teil : Die Geschichte des Qorantexts. 80 S. Von G. BERGSTRÄSSER, Lieferung I. Leipzig, DIETERICH, 1926. ISIS

Reviewed by R. HARTMANN, *Der Islam*, 272-74, 1927.

VIIIth Century (second half).

Ruska, Julius. JÂBIR IBN ḤAJJÂN und seine Beziehungen zum imâm JA'FAR AS-ṢÂDIQ. *Der Islam*, 16, 264-66, 1927. ISIS

Ruska, Julius. Das Giftbuch des JÂBIR IBN ḤAJJÂN, *Orientalistische-Literaturzeitung*, Sp. 453-56, 1928. (not seen) ISIS

IXth Century (whole and first half)

Brögger, A. W.; Falk, Hj.; Schetelig, Haakon. Osebergfundet. With a summary in English. Bind I., av A. W. BRÖGGER, W. C. BRÖGGER, JENS HOLMBOE, HAAKON SCHETELIG. Bind III., av HAAKON SCHETELIG. XII + 413 p., 27 pl., VIII + 439 p. Kristiania, Universitetets Oldsaksamling, 1917, 1920. ISIS

Reviewed by WALDEMAR WESTERGAARD, *American Historical Review*, 33, 850-1, 1928.

(Ibn Saad). Biographien MUHAMMEDS, seiner Gefährten, und der späteren Träger des Islams bis zum Jahre 230 der Flucht. Herausgeben von EDUARD SACHAU. In nine volumes. Leiden, E. J. BRILL, 1905-1928. ISIS

Reviewed by D. B. MACDONALD, *American Historical Review*, 34, 154, 1928.

IXth Century (second half).

Farmer, Henry George. IBN KHURDÂDHBIH on musical instruments. *Journal of the Royal Asiatic Society*, 509-518, 1928. ISIS

(al-Jâḥiẓ). Three essays of ABÛ 'OTHMAN 'AMR IBN BAḤR AL-JÂḤIẒ (d. 869). Edited from three manuscripts, with introductions by JOSHUA FINKEL. 78 p. (all in Arabic). Cairo, Salafyah Press, 1344 (1926). ISIS

Reviewed by GEORGE SARTON, *Isis*, 10, 494-5, 1928.

(al-Ṭaḥâwî). Das Kitâb adhkar al-ḥuqûq war-ruhûn aus dem al-jâmi' al-kabîr fish-shurûṭ des ABÛ JA' FAR AḤMAD IBN MUḤAMMAD AL-ṬAḤÂWÎ hrsg. von JOSEPH SCHACHT. (*Sitz.ber.d. Heidelberg. Akad. d. Wiss., philos.-hist. Kl.*, Jg. 1926-7, 4. Abhlg.) VIII + 42 p. Heidelberg, CARL WINTER, 1927. ISIS

Reviewed by WILHELM HEFFENING, *Deutsche Literaturzeitung*, 953-55, 1928

Xth Century (whole and first half).

al-Mu'tazilî, Abû'l-Ḥusain 'Abdarraḥîm ibn Muḥammed ibn 'Othmân al-Khaijat. Kitâb al-intiṣâr wal-radd 'alâ IBN AL-RAWENDI al-Mulḥid. Le livre du triomphe et de la réfutation d'IBN ER-RAWENDI l'hérétique. Texte arabe publié pour la première fois d'après le manuscrit unique conservé dans la Bibliothèque Egyptienne du Caire avec une introduction, des notes et des index par H. S. NYBERG. LXVI + 252 p. Le Caire, Imprimerie de la Bibliothèque Egyptienne, 1344/1925. ISIS

Reviewed by R. STROTHMANN, *Der Islam*, 16, 280-3, 1927.

Plessner, Martin. Der Inhalt der nabatäischen Landwirtschaft. Ein Versuch, IBN WAḤSHÎJA zu rehabilitieren. *Zeitschrift für Semitistik und verwandte Gebiete*, 6, 27-56, 1928. ISIS

Xth Century (second half.)

Maslama ibn Aḥmad (*Introduction*, vol. I, 668). MASLAMA's version of PTOLEMY's Planisphere was translated by HERMANN THE DALMATIAN, rather than by RUDOLPH OF BRUGES. See my vol. 2. G. S. ISIS

Murasaki, Lady. Blue trousers : Being the fourth part of « The tale of Genji. » Translated from the Japanese by ARTHUR WALEY. 333 p. London, ALLEN and UNWIN, 1928. ISIS

XIth Century (whole and first half).

Capparoni, Pietro. Il « De Quattuor humoribus corporis humani » di ALFANO Arcivesco di Salerno (Sec. XI). Trascrizione del Codice Vallicelliano F. 86 (no. 10), annotazioni e commento, tavole e ripro-

duzione in fac-simile del testo. Prefazione del Prof. ARTURO CASTIGLIONI. 27 p., 3 pl., facs. Roma, Istit. Naz. Med. Farmacol. « Serono », 1928. ISIS

Reviewed by HABERLING, *Mitteilungen zur Geschichte der Medizin und Naturwissenschaften*, 27, 338, 1928.

Meyerhof, Max. An Arabic compendium of medico-philosophical definitions. *Isis*, 10, 340-9, 1928. ISIS

Apropos of Al-rauḍa al-ṭibbiyya of 'UBAID ALLÂH IBN JIBRÎL IBN BAKHTYASHÛ' (SARTON, vol. 1, 730).

Schoy, Carl (1877-1925). Die trigonometrischen Lehren des persischen Astronomen ABÛ L-RAIḤÂN MUḤ. IBN AḤMAD AL-BÎRÛNÎ dargestellt nach al-Qânûn al-Mas'ûdî. Nach dem Tode des Verfassers herausgegeben von JULIUS RUSKA und HEINRICH WIELEITNER. XII + 108 p., 50 fig. Hannover, HEINZ LAFAIRE, 1927. (Mk. 16) ISIS

Reviewed by GEORGE SARTON, *Isis*, 10, 495-7, 1928.

XIth Century (second half).

Bidez, Joseph. MICHEL PSELLUS. Epître sur la Chrysopée. Opuscules et extraits sur l'alchimie, la météorologie et la démonologie. En appendice, PROCLUS sur l'art hiératique. PSELLUS. Choix de dissertations inédites (Catalogue des manuscrits alchimiques grecs, 6). XIV + 246 p. Bruxelles, LAMERTIN, 1928. ISIS

This volume is almost entirely devoted to PSELLOS, and contains critical editions of a number of his writings. See my review in *Isis*, 12, 165-8.G. S.

al-Ghazzâlî. Tahafot al-falasifat. Texte arabe établi et accompagné d'un sommaire latin et d'index, par MAURICE BOUYGES, S. J. XXX + 448 p. Beyrouth, Imprimerie Catholique, 1927. ISIS

Reviewed by DUNCAN B. MACDONALD, *Isis*, 10, 497-99, 1928.

Salet, Pierre. OMAR KHAYYAM savant et philosophe. 165 p. Paris, Librairie MAISONNEUVE, 1927. (15 frs.) ISIS

Reviewed by H. D., *Journal des Savants*, 295-96, 1928

Somadeva. The ocean of story. Being C. H. TAWNEY's translation of SOMADEVA's Kathâ Sarit Sâgara. Edited with introduction, fresh explanatory notes, and terminal essay, by N. M. PENZER. Vol. VIII. XXXV + 361 p. London, CHAS. J. SAWYER, 1927. ISIS

Reviewed by JARL CHARPENTIER in *Joural of the Royal Asiatic Society*, 679-681, 1928.

Theobald (Dr. Ing.). Was sagt uns die Schedula diversarum artium

des THEOPHILUS presbyter? *Beiträge zur Geschichte der Technik und Industrie*, 16, 217-22, 321, 1926. ISIS

Summary of the technical contents of the Schedula of which the author has prepared a German translation as yet unpublished. See SARTON's Introduction (vol. 1, 763). G. S.

XIIth Century (whole and first half).

Efros, Israel. Studies in Pre-Tibbonian philosophical terminology. I. ABRAHAM BAR HIYYA, the Prince. *The Jewish quarterly review*, 17, 129-164, 323-368, 1926-1927. ISIS

This study aims to present the various philosophical, mathematical, astronomical and calendrical terms (ancient and medieval philosophy drew no sharp line of demarcation between any of the above sciences, as is also shown by the variety of meaning of the term pilosofim) which ABRAHAM the son of ḤYYA, a pioneer in the use of the sacred tongue for his meditations and investigations, employed in his chiefly ethical work *Hegyon ha-nefesh*, in his geometrical work *Sefer-ha-meshiḥah weha-tishboret* (at the end of which GUTTMANN has an inadequate list of terms), and in his calendrical work *Sefer ha-'ibbur*, in his astrological and eschatological work *Megillat ha-megalleh*, and in his astronomical work *Ṣurat ha-areṣ*. It will aid us, together with subsequent studies in pre-Tibbonian terminology, in determining with some exactness the debit and credit accounts of the great translators. Interesting is the fact that SAMUEL IBN TIBBON himself did not seem to be fully aware of the whole extent of his debt.

Gânguly, Sâradâkânta. BHÂSKARÂCHÂRYA and simultaneous indeterminate equations of the first degree. *Bulletin of the Calcutta mathematical society*, 17, 89-98, 1926. ISIS

« We conclude that BHÂSKARÂCHÂRYA considered the general case of simultaneous indeterminate equations of the first degree, which might be stated thus :

$a_1 x \pm c_1 = b_1 y$, $a_2 x \pm c_2 = b_2 z$, $a_3 x \pm c_3 = b_3 w$, etc.

and that he gave the rule quoted above for its solution. »

Gânguly, Sâradâkânta. BHÂSKARÂCHÂRYA's references to previous teachers. *Bull. of the Calcutta mathematical society*, 18, 65-76, 1927. ISIS

« The object of this paper is not to disprove the foreign origin (if any) of Indian mathematics. The fact that BHÂSKARÂCHÂRYA referred to Indian mathematicians only cannot, by itself, establish indigenous origin. »

Haskins, Charles Homer. The renaissance of the twelfth century. XI + 437 p. Cambridge, Harvard University Press, 1927. ISIS

Reviewed by GEORGE SARTON, *Isis*, 10, 62-5, 1928.

Steele, Robert and **Singer, Dorothea Waley.** The Emerald Table.

Reprinted from the *Proceedings of the Royal Society of Medicine*, 21, (Section of the History of Medicine, p. 41-57), 1928. ISIS

« The subject of our paper is a translation made, probably early in the twelfth century, from an Arabic collection of explanations and commentaries on a document known as the Emerald Table of HERMES. The translation we publish is met with in Latin, sometimes as a whole, sometimes in extracts, and its publication is intended to be a supplement to the masterly study of the Emerald Table in its Arabic and Latin forms recently made by Professor RUSKA... »

« Our text is anonymous, but we identify the translator, with some hesitation, as PLATO OF TIVOLI, one of the earliest to make versions from the Arabic. His known works fall in the second quarter of the twelfth century (1134-45). Our reasons for this supposition are the style, which is very like that of his previously known writings, and seems very early, and that the translator speaks of the work as 'ante ab omni latinitate intractata,' an expression pointing to early work. As an entirely different version of a similar Arabic text was made about the same period by HUGO SANCTALLENSIS, the claim of being the first translation must imply an early date. A further consideration is that our translation has slightly Hebraized forms of Arabic names, since we know that PLATO was assisted in his versions by the Jew, SAVASORDA. »

Carlyle, Sir **R. W.** and **Carlyle, A. J.** A history of mediaeval political theory in the west. Vol. 5. The political theory of the thirteenth century. XX + 494 p. Edinburgh, BLACKWOOD, 1928. ISIS

From the Preface : « It is now a little more than thirty-five years since we began this work, and this volume represents more or less what we then thought to produce, but we had not gone very far before we recognised that in order to understand the real character of the political theory of the Middle Ages it was necessary to go back for many centuries, especially to the Roman Jurists of the second century, and to the Christian Fathers, and even to make some examination of the political conception of the post-Aristotelian philosophy, from which both Jurists and Fathers derived some of their most important principles. We have in previous volumes therefore endeavoured to set out something of the history of mediaeval political theory, and to give their due weight to the various traditions out of which it arose, and by which it was influenced in varying degrees. In this volume we have endeavoured to set out the culmination of this long process of development in the thirteenth century.

« We hope to publish another volume dealing with the movements of political thought from the fourteenth to the sixteenth centuries — that is, during the period of the Renaissance — and to inquire what if any new conceptions of importance took their rise during these centuries, and thus to see more clearly how far modern political conceptions are continuous with those of the Middle Ages. »

Haskins, Charles H. The « alchemy » ascribed to MICHAEL SCOT. *Isis*, 10, 350-9, 1928. ISIS

Powicke, Frederick Maurice. STEPHEN LANGTON (d. 1228). Oxford, Clarendon Press, 1928. ISIS

XIIIth Century (second half).

(Bacon, Roger). Opera hactenus inedita ROGERI BACONI fasc. IX. De retardatione accidentium senectutis. Cum aliis opusculis de rebus medicinalibus. Nunc primum ediderunt A. G. LITTLE, E. WITHINGTON. XLIV + 224 p. Oxford, Clarendon Press, 1928. ISIS

Blondheim, David Simon. An old Portuguese work on manuscript illumination. *Jewish Quarterly Review*, 19, 97-135, 1928. ISIS

Hebrew text, with English translation and a few notes, of this treatise in 45 chapters, covering 20 pp. and in the MS. De Rossi 945 of the R. Biblioteca Palatina of Parma. A colophon at the end of the ninth opuscle in the Ms. states that it was finished by ABRAHAM B. JUDAH IBN HAYYIM at Loulé, Portugal, in 1262. However the present form of the text seems to date from a somewhat later period. At any rate it would be interesting to compare this Hebrew text with the Latin texts of the same kind. It deals with the usual subjects : How to make gold paint, excellent blue, rose color (e.g., with brazil wood), red lead, verdigris, carmine, vermilion; how to color bones, boxwood; of filed bones how to make chessmen; how to make glue, varnish, etc. G. S.

Davis, Tenney L. ROGER BACON's gunpowder and his secret wisdom. *Industrial and Engineering Chemistry*, 20, 772, etc., 1928; reprint, 6 p. ISIS

Graux, Lucien. Le docteur illuminé, roman. 419 p. Paris, FAYARD, 1927. ISIS

Biography of RAMON LULL in the form of a novel. G. S.

Thorndike, Lynn. ANDALÒ DI NEGRO, PROFACIUS JUDAEUS, and the Alphonsine Tables. (Query 8) *Isis*, 10, 52-56, 1928. ISIS

XIVth Century (whole and first half).

Asín, Miguel. Islam and the Divine Comedy. Translated and abridged by HAROLD SUNDERLAND, with an introduction by the DUKE OF BERWICK AND ALBA. XXVI + 295 p. London, MURRAY, 1926. ISIS

Reviewed by GEORGE SARTON, *Isis*, 10, 65-9, 1928.

Brun, Robert. Avignon au temps des papes : les monuments, les artistes, la société. 288 p., 8 pl. Paris, COLIN 1928. ISIS

Reviewed by MARCEL AUBERT, *Journal des Savants*, 371, 1928.

Ibn Faḍl Allâh al-'Umarî (1301-49). Masâlik el abṣâr fi mamâlik el amṣâr. I. L'Afrique, moins l'Egypte. Traduit et annoté avec une introduction et 5 cartes par MAURICE GAUDEFROY-DEMOMBYNES.

LXVIII + 284 p. (Bibliothèque des géographes arabes, vol. 2). Paris, GEUTHNER, 1927. (100 frs.) ISIS

The appearance of this very careful translation of an important part of the Masâlik gives me an opportunity of drawing our readers' attention to this new collection of Arabic geographical texts. They are published in French translation under the direction of GABRIEL FERRAND, whose name is a scientific guarantee. The translator of the present text has added a very learned introduction (dealing mainly with the Almohade administration, ceremonial and chancery), abundant notes, index and five maps : Abyssinia Tunis, Morocco, Marrakesh, Granada. A few other texts are translated in appendix for the sake of comparison. He needs no introduction to the readers of this journal, for two of his works have already been discussed, La Syrie à l'époque des Mamelouks (Paris, 1923 ; *Isis*, 6, 561) and Le Pèlerinage à la Mekke (Paris, 1923 ; *Isis*, 8, 209). FERRAND's collection will include not only the texts edited by M. J. DE GOEJE in his ***Bibliotheca geographorum arabicorum*** but also a few others, some of them as yet unpublished. Our every good wish to this great and useful undertaking !

G. S.

(Marsiglio of Padua). The Defensor pacis of MARSILIUS OF PADUA. Edited by CHARLES WILLIAM PREVITÉ-ORTON. XLVII + 517 p., 5 pl. London, Cambridge University Press, 1928. ISIS

Critical edition of this great classic of political literature, with notes, indexes, and introduction. The *Defensor pacis* was completed by MARSIGLIO on 24 June 1324, with the collaboration of JOHN OF JANDUN. « It is natural to ask whether the precise share of JOHN OF JANDUN can be detected in the composition. A definite answer, if at all possible, could only be given after a very thorough comparison of his own works with the *Defensor Pacis* ; but it appears to me that his influence is more pervasive than local. The style of the book gives little help : it changes with the theme and the books used. When papal bulls are being answered it markedly echoes their phrases and indignant rhetoric, and JOHN XXII and CLEMENT V are refuted in their own manner ; when the Latin ARISTOTLE is studied, its mannerisms appear. As JOHN OF JANDUN was a devout Aristotelian of sceptical and Averroistic tendencies, veiled in irony, he may come more to the surface in those few passages where Aristotelian transcription is more complete, the thought more abstract, and the tone sceptical. The main author had a paternal affection for his presbyterian system, his erastianism, and a passionate republicanism, which bursts out in rhetoric even in a passage on taxation. This main author seems to me to be MARSILIUS OF PADUA, bred in an Italian commune, hating the ecclesiastical powers which put it out of gear, and anxious to combine the sharply bounded and compact unitary State he loved with a kind of society of Christendom guided by its elected advisory General Council. »

G. S.

Thorndike, Lynn. The clocks of JACOPO and GIOVANNI DE' DONDI. *Isis*, 10, 350-2, 1928. ISIS

XIVth Century (second half).

Thomson, S. Harrison. Some Latin works erroneously ascribed to WYCLIF. *Speculum*, 3, p. 382-91, 1928. ISIS

XVth Century (whole and first half).

(Hus, John). Tractatus Responsivus. Edited by S. HARRISON THOMSON. XXXIV + 173 p. Princeton, Princeton University Press, 1927. ISIS

Vogts, Hans. Hospital St. Nikolaus zu Cues. 52 p., ill. Augsburg, Dr. B. FILSER, 1927. ISIS

XVth Century (second half).

Antz, E. L. Das Wasserwerk der Stadt Halle (1467). *Beiträge zur Geschichte der Technik und Industrie*, 12, 124-27, 1922. ISIS

Horwitz, Hugo Th. GIULIANO DA SAN GALLO (1445-1516). *Beiträge zur Geschichte der Technik und Industrie*, 16, 200-216, 29 fig., 1926. ISIS

« Obwohl GIULIANO DA SAN GALLO nicht in demselben Masse Universalgenie wie LEONARDO DA VINCI war, so erkennt man aus der vorliegenden Abhandlung doch, dass er als echter Renaissance-künstler seinen Fachgenossen in vielseitiger Begabung und Betätigung keineswegs nachstand. Von Haus aus Bildschnitzer, entwickelte er sich zu einem bedeutenden Architekten, Kriegsbaumeister und Militäringenieur, und wie hier dargelegt wurde, sind auch seine Zeichnungen, die in der Ausführung denen LEONARDO DA VINCI's oft gleichgestellt werden können, beachtenswert; einzelne von ihnen weisen sogar ganz eigenartige, selbst den Kenner der damaligen technischen Leistungen überraschende Konstruktionen auf, die sich bei anderen Meistern dieser Zeit nicht vorfinden. Wo sich jedoch solche Beziehungen feststellen liessen, wurde ihnen hier nach Möglichkeit nachgegangen und die gegenseitige Abhängigkeit der Entwürfe voneinander klarzulegen versucht. Um die Eigenart SAN GALLO's zu kennzeichnen, muss aber darauf hingewiesen werden, dass er vor allem als hervorragender Baukünstler der Renaissance Geltung besitzt, und dass er neben den technischen Darstellungen durch die vielen Zeichnungen von Bauten des alten Roms starke archäologische Neigungen bewiesen hat, die beispielsweise LEONARDO DA VINCI keinesfalls in diesem Ausmasse zeigte. »

Thorndike, Lynn. BISTICIUS (or BISTICHIUS) of Florence. Reprinted from the *Romanic Review*, 19, 244-49, 1928. ISIS

« In the work of JOHN OF AREZZO addressed to LORENZO DE MEDICI on the relative importance of medicine and law, of which I treated in a previous number of this Journal, in a discussion of medical quacks in the city of Florence, reference was made to 'BISTICIUS, a silversmith of Florence, a man ignorant of letters' who 'suddenly became the leading physician in the whole city.' I have since found other estimates of this BISTICIUS, or BISTICHIUS, which

are more favorable and also some examples of his own medical recipes. »

Leonardo da Vinci

Semenza, Guido. L'automobile di LEONARDO. *Archeion*, 9, 96-103, 1928. ISIS

Examen de deux dessins du *Codex atlanticus*, qui représentent l'un et l'autre un véhicule avec un système de roues dentées, lequel pourrait bien être une automobile avec son différentiel ? L. G.

XVIth Century (whole and first half).

A. — *Mathematics.*

Cajori, Florian. CIRUELO on the names « arithmetical » and « geometrical » proportions and progressions. *Isis*, 10, 362-66, 1928. ISIS

Apropos of PEDRO SANCHEZ CIRUELO : *Cursus quatuor mathematicarum artium liberalium* (Alcala, 1516).

B. — *Physical sciences and Technology.*

Johannsen, Otto. BIRINGUCCIO und seine Pirotechnia. *Beiträge zur Geschichte der Technik und Industrie*, 16, 153-161, 3 fig., 1926. ISIS

C. — *Natural Sciences.*

Boyce, Helen (-1920). The mines of the Upper Harz from 1514 to 1589 (*Diss.*, Chicago; 130 p.; Menasha, Wisconsin, 1920). ISIS

Based upon Die Bergchronik des HARDANUS HAKE, Pastors zu Wildemann, edited by H. DENKER of Osnabrück (Wernigerode, 1911). HAKE's chronicle of the Upper Harz mines covers the years 1505 to 1583. The author has added a brief survey of German mining and of the Harz mines. The history of the latter falls into two periods. « The first was closed by the Black Death (1347); from that time the mines lay idle for more than a hundred years before work was recommenced in the late fifteenth century. Though there is no historical continuity between the two periods, the inclusion of the earlier one seemed justified by the demands of the subject as well as by the plan of HAKE's chronicle on which this study was based. » G. S.

Doesborch, Jan van. (Antwerp, about 1520). De novo mondo. Edited with transcription and translation of the Latin text and introduction by M. E. KRONENBERG. The Hague, MARTINUS NIJHOFF, 1928. ISIS

« Facsimile of an unique broadsheet containing an early account of the inhabitants of South America together with a short version of HEINRICH SPRENGER's Voyage to the Indies. »

Stevens, Henry N. The first delineation of the New World and the first use of the name America on a printed map. An analytical com-

parison of three maps for each of which priority of representation has been claimed (two with name America and one without). With an argument tending to demonstrate that the earliest in each case is the one discovered in 1893 and now preserved in the John Carter Brown Library at Providence, R. I. XVI + 127 p., facs. London, HENRY STEVENS, Son and STILES, 1928 (three guineas). ISIS

This splendid publication is enriched by two facsimile maps (a) the Stevens-John Carter Brown map, to which it is specially devoted, (b) the 1513 PTOLEMY maps, *Orbis typus universalis*.

It is divided into three parts, the first of which is devoted to proving that the first of these maps is the prototype of the *Orbis Typus* in the 1513 PTOLEMY; that it was designed and prepared by WALDSEEMÜLLER and his confrères of the Gymnase at St. Dié probably as early as 1505 : that it was engraved at Nuremberg and printed there, probably as early as 1505, with Nuremberg type-letterings on Nuremberg paper; that it is in all probability the first specimen or experimental design made for the series of maps which the St. Dié cartographers intended adding to their proposed new edition of PTOLEMY, which we know was in active preparation at that time; that it is the first printed map yet known to show any part of the New World discoveries; that it is the first printed map on which the New World discoveries are marked with the name America.

In the second part, the author offers evidence to show that map (a) is anterior to the large WALDSEEMÜLLER map of 1507 discovered by JOSEPH FISCHER at Wolfegg castle in 1901.

In the third part, he argues that it is also anterior to the G. M. CONTARINI map of 1506, discovered in the British Museum, and published by the Museum in 1924, second ed., 1927, (*Isis*, 7, 205, 206, 544; 10, 146). G. S.

Varthema, Ludovico di. The itinerary of LUDOVICO DI VARTHEMA of Bologna from 1502 to 1508. As translated from the original Italian edition of 1510 by JOHN WINTER JONES in 1863 for the Hakluyt Society with a discourse on VARTHEMA and his travels in southern Asia by Sir RICHARD CARNAC TEMPLE. LXXXV + 121 p. London, Argonaut Press, 1928. ISIS

D. — *Medical Sciences.*

Dawson, Percy M. The heritage of PARACELSUS. *Annals of Medical History*, 10, 258-69, 1928. ISIS

Negker, Jost de. Die anatomischen Tafeln des JOST DE NEGKER 1539. Hrsg. von KARL SUDHOFF und MAX GEISBERG. 6 S., Folio, 6 Taf., 2 Abb. München, SCHMIDT, 1928. ISIS

Paracelsus. Medizinische, naturwissenschaftliche und philosophische Schriften, hrsg. von KARL SUDHOFF. Zehnter Band: Die grosse Wundarznei und anderes Schriftwerk des Jahres 1536 aus Schwaben und

Bayern. XLVIII + 688 S., 16+32 Abb. München, OLDENBOURG, 1928. ISIS

Reviewed by KARL SUDHOFF, *Mitteilungen zur Geschichte der Medizin*, 27, 196, 1928.

Paracelsus. Sämtliche Werke nach der 10 bändigen Huserschen Gesamtausgabe (1589-1591). Zum erstenmal in neuzeitliches Deutsch übersetzt, mit Einleitung, Biographie, Literaturangaben und erklärenden Anmerkungen versehen von BERNHARD ASCHNER. Zweiter Band, 910 S. Jena, FISCHER, 1928. ISIS

(Pharmacopoeia Augustana). A facsimile of the first edition of the Pharmacopoeia Augustana. With introductory essays by THEODOR HUSEMANN. (Publications of the State Historical Society of Wisconsin, Hollister Pharmaceutical Library, No. 1). Madison, 1927. ISIS

Reviewed by GEORGE SARTON, *Isis*, 10, 69-71, 2 pl., 1928.

Szumowski, W. Note sur deux écrits médicaux de MATHIAS DE MIECHOW. Communication faite au Vme Congrès International d'histoire de la médecine. 3 p. Geneva, A. KUNDIG, 1926. ISIS

A propos of the two following plague treatises by the Polish historian, humanist, and physician, MATTHEW OF MIECHOW (1457-1523); both printed at Cracow in 1508 : (1) Contra saevam pestem regimen accuratissimum; (2) Fructuosa doctrina de sanguinis missione deque non nullis aliis probatissimis atque salutaribus remediis adversus horrendam pestilentiae luem. Brief analysis of both. G. S.

Williams, George A. MICHAEL SERVETUS, physician and heretic. *Annals of Medical History*, 10, 287-92, 1928. ISIS

E. — *Alia.*

Ehrenberg, Richard. Capital and finance in the age of the Renaissance. A study of the FUGGERS and their connections. Translated from the German by H. M. LUCAS. 390 p. London, JONATHAN CAPE, 1928. ISIS

Hassler, Friedrich. Augsburger Kaufleute und Tiroler Bergarbeiter im 16. Jahrhundert in England. *Beiträge zur Geschichte der Technik und Industrie*, 17, 80-88, 5 fig. 1927. ISIS

Herborn, Nicolaus. Locorum communium adversus huius temporis heareses enchiridion (1529). Hrsg. v. P. PATRICIUS SCHLAGER. (Corpus Catholicorum, H. 12). XXVIII + 192 p. Münster, ASCHENDORFF, 1927. ISIS

Reviewed by ANDREAS BIGELMAIR, *Deutsche Literaturzeitung*, 5, 1798-1800, 1928.

Stapleton, Thomas (1535-98). The life and illustrious martyrdom of Sir THOMAS MORE. Translated, for the first time, into English by PHILIP E. HALLETT. London, BURNS OATES, 1928. ISIS

The Latin text was published at Douay in 1588.

XVIth Century (second half).

A. — *Mathematics.*

Ginsburg, Jekuthiel. On the early history of the decimal point. *The American Mathematical Monthly*, 35, 347-349, facs., 1928. ISIS

« The purpose of this article is to call attention to a fact which seems to have been overlooked by all historians, namely, that the credit of being the first to use a dot (point) as a separatix, with a full knowledge of its significance in this connection, is due to the Jesuit father CHRISTOPHER CLAVIUS (1537-1612). In his work on the astrolabe, published in Rome in 1593 he gives (pp. 195-270) a 'Tabula Sinuum,' where the proportional parts are separated from the integers by periods (points, dots). »

Vetter, Quido. Arithmetica de JIRIK GOERL z Goerlsteyna. 2 p. dated Prague April 1928, apparently reprinted from *Schola et vita*, organo de academia pro interlingua. ISIS

JIRIK (i.e. GEORGE) GOERL (or GEHR, GERL) was born in Elnbogen, northern Bohemia; in 1566-67 he was teaching in Litomerice, later he was « arithmeticus » in Prague. He published a German arithmetic « Ein nutzlich und künstlich Rechenbuch », in Prague, 1577 (preface dated 1576.12.24) and soon afterwards an enlarged edition in Bohemian (preface dated 1577.08.07).

G. S.

C. — *Natural Sciences.*

Bushnell, Jr., David I. Drawing by JACQUES LEMOYNE DE MORGUES of SATURIOUA, a Timucua chief in Florida, 1564. *Smithsonian miscellaneous collections*, vol. 81, no. 4, 9 p., 1 fig., 1 pl. Washington, Smithsonian Institution, 1928. ISIS

« Not until the year 1564, when the French expedition led by LAUDONNIÈRE set sail from Havre de Grace for the Land of Florida, did an artist accompany an expedition for the definite purpose of making drawings to be taken back to Europe. Consequently JACQUES LEMOYNE DE MORGUES, artist, who accompanied LAUDONNIÈRE, made the earliest known pictures of Indians of North America. Many sketches were undoubtedly made by the artist during the eventful year he remained in Florida but only one original example of his work can now be traced, this being a drawing of the great chief SATURIOUA who claimed the land on which the French erected Fort Carolina ».

Wagner, Henry R. Sir FRANCIS DRAKE's voyage around the world,

its aims and achievements. x + 543 p. San Francisco, HOWELL, 1926. ISIS

Reviewed by ZELIA NUTTALL, *American Historical Review*, 34, 114-17, 1928.

D. — *Medical Sciences.*

Nuyens, B. W. Th. Een vliegend blaadje uit de 16de eeuw, als reclame voor de badplaats Pyrmont. *Bijdragen tot de geschiedenis der geneeskunde* 8, 113-118, 1928. ISIS

Pas, J. de ; Lanselle, M. Documents sur la peste de 1596 à Saint-Omer. *Bulletin de la société française d'histoire de la médecine*, 22, 206-16, 1928. ISIS

Price, George E. SHAKESPEARE as a neuropsychiatrist. *Annals of medical history*, 10, 159-64, 1928. ISIS

Sabbatani, Luigi. Acqua vitae LUCAE GHINI. *Arch. di storia d. sc.*, 8, 477-84, 1927. ISIS

La formule de cette *acqua vitae* nous a été conservée par JOHANN JACOB WECKER (Bâle, 1528-Colmar, 1586), dans son *Antidotarium generale* (1574-6), et par GIOVANNI BATTISTA CORTESI (Bologna, 1556-Reggio Calabria, 1636), dans sa *Pharmacopeia, seu Antidotarium Messanense*, 1629. — Composition de cette *aqua vitae*; son action pharmacologique. L. G.

E. — *Alia.*

Camoens, Luis de. Os Lusiadas. Lisbon, Imprensa Nacional, 1928. ISIS

Critical edition prepared by ALONSO LOPES VIEIRA and JOSÉ MARIA RODRIGUES.

Mesnard, Pierre. DU VAIR et le néo-stoïcisme. *R. d'hist. de la philosophie*, 2, 142-66, 1928. ISIS

GUILLAUME DU VAIR (Paris, 1556-Tonneins, 1621), magistrat et philosophe.

XVIIth Century (whole and first half).

A. — *Mathematics.*

Artom, Emilio. Sul concetto di rapporto secondo GALILEO GALILEI. *Bolletino di Matematica*, 50-2, Maggio, 1928. ISIS

Caspar, Max. JOHANNES KEPLER und seine Entdeckung des Flächensatzes. Festschr. z. 30 Hauptvers. der Deutsch. Ver. z. Ford. der math. und nat. Unt. zu Stuttgart, 44-53, Bildnis, 1928. ISIS

Descartes, René. La géométrie. Nouvelle édition, avec portrait de DESCARTES, d'après FRANS HALS. Paris, J. HERMANN, 1927. ISIS

Reproduction d'une édition de la Géométrie, que rien ne permet d'identifier, l'éditeur ayant substitué son nom au nom de l'éditeur dont il reproduit la typographie, et le millésime 1927 à l'année de l'apparition de l'édition reproduite. L. G.

Feldhaus, Franz Maria. Die logarithmischen Rechenstäbe und ihre Nachfolger. 4. Euklid-Feldhaus-Beilage zur Maschinen-Buchhaltung, p. 13-16, illus., 1928. ISIS

Feldhaus, Franz Maria. Eine Rechenschiene von 1609. 5. Euklid-Feldhaus-Beilage zur Maschinen-Buchhaltung, 4 p., August, 1928. ISIS

Kokomoor, F. W. The teaching of elementary geometry in the seventeenth century. Preface by L. C. KARPINSKI. *Isis*, 10, 21-32, 1928 ISIS

Kokomoor, F. W. The distinctive features of the seventeenth century geometry. *Isis*, 10, 367-415, 1928. ISIS

(Pascal, Blaise). « Essay pour les coniques ». Translated by FRANCES MARGUERITE CLARKE. Preface by DAVID EUGENE SMITH. *Isis*, 10, 16-20, double pl., 1928. ISIS

Wieleitner, H. Zur Geschichte der Polargleichung der Ellipse. *Unterrichtsblätter für Mathematik und Naturwissenschaften*, 34, 276-7, 1928. ISIS

Explaining KEPLER's discovery of it in modern language. G. S.

B. — *Physical Sciences and Technology.*

Jungius, Joachim (Lübeck 1587 — Hamburg, 1657). Zwei Disputationen über die Prinzipien (Teile) der Naturkörper. 35 p. Hamburg, Gutenberg Verlag, 1928. ISIS

The two disputations *De principiis corporum naturalium* here translated are both dated Hamburg, 1642. This handsome booklet was distributed to the members of the ninetieth meeting of the Deutsche Naturförscher und Arzte (Hamburg, 1928), a very appropriate gift, which I hope will help to draw the attention of the learned world upon a great but neglected personality. I quote from ADOLF MEYER's excellent introduction :

« JOACHIM JUNGIUS hat in der Geschichte der Naturwissenschaften und der Logik tatsächlich die Rolle gespielt, die die Nachwelt in der Regel, aber zu Unrecht dem Engländer FRANCIS BACON zugewiesen hat. Die wesentliche Leistung der 'neuen Wissenschaft', die GALILEI, HARVEY und DESCARTES der Menschheit gebracht haben, besteht nicht darin, auf induktive Weise Erfahrungen zu sammeln und Experimente anzustellen — beides hat man

in der Antike, besonders im Athen des ARISTOTELES, in Alexandrien und im Rom GALENS bereits ausgezeichnet verstanden, — sondern lediglich in dem Bestreben, die Naturerscheinungen mathematisch zu bewältigen und so die Naturwissenschaften zu mathematisieren. In diesem Sinne formulierte GALILEI als das Leitmotiv seiner «ganz neuen Wissenschaft von uralten Dingen' die Forderung, 'zu messen, was man messen kann, und messbar zu machen, was man noch nicht messen kann'. BACON hat von diesem neuen Geiste nur wenig gespürt. Nicht nur sind seine 'Tabulae' der Induktion geradezu erstaunlich hilflose Gebilde, er selbst hat auch jene grossen Forscher, die wie KEPLER, KOPERNIKUS und GALILEI das Neue zu seiner Zeit bereits verwirklichten, nicht nur nicht verstanden, sondern sogar bekämpft. Ganz anders JUNGIUS. Er hat einmal durch klare Erkenntnis der Bedeutung der Mathematik für die neue Naturerkenntnis—seine Giessener Antrittsvorlesung, die er im Alter von 20 Jahren hielt, als gerade GALILEIS erste Werke erschienen waren, führt schon den Titel : *De matheseos dignitate, praestantia et usu* — begriffen, wohin die neue Reise des forschenden Geistes gehen würde, er hat weiterhin der werdenden Naturerkenntnis, nsbesondere der neuen Physik, in seiner *Logica Hamburgensis* auch die ständig an LEIBNIZ, der JUNGIUS stets sehr bewundert hat, und KANT gemahnende erkenntnistheoretische Grundlage gegeben.

«Darüber hinaus hat er durch sein der gleichen mathematisierenden Tendenz entsprungenes Bestreben, die Atomistik DEMOKRITS, die einzige antike Lehre, die der modernen Naturwissenschaft geistesverwandt ist, zu erneuern, auch positiv in die Gestaltung der modernen Physik eingegriffen. Seiner logischen Ader entsprechend gibt er in den hier vorliegenden beiden Disputationen, deren Bedeutung für das Lebenswerk von JUNGIUS zuerst WOHLWILL, der hervorragende GALILEI- und JUNGIUSforscher, sichergestellt hat, so etwas wie eine Axiomatik der Atomistik. Wir finden hier nicht nur alle späteren von DALTON und BOYLE entwickelten Theorien klar entwickelt, manche Sätze gemahnen direkt an Modernstes, z. B. enthalten schon die ersten Paragraphen Bestimmungen, wie sie die moderne Gestalttheorie nicht präziser hat formulieren können.

«In unsern Tagen, in denen gerade die physikalische Atomistik nie geahnte Triumphe feiert, lohnt es sich daher wohl, die Blicke auf einen ihrer theoretischen Begründer und scharfsinnigsten Logiker zurückzulenken. Die hier vorliegenden Übersetzungen hatte WOHLWILL seiner Abhandlung : JOACHIM JUNGIUS und die Erneuerung atomistischer Lehren im 17. Jahrhundert (in : *Abh. a. d. Gebiete der Naturwiss*, Bd. 10) Hamburg 1887 auf den Seiten 31 bis 43 eingefügt. Hier erscheinen sie zum ersten Male als eine Art 'Klassiker der exakten Wissenschaften' für sich.» G. S.

Olschki, Leonardo. Geschichte der neusprachlichen wissenschaftlichen Literatur. III. Band : GALILEI und seine Zeit. VIII + 479 S. Halle (Saale), MAX NIEMEYER Verlag, 1927. ISIS

Reviewed by H. WIELEITNER, *Isis*, 10, 499-501, 1928.

Strauss, Heinz Artur und **Strauss-Klöbe, Sigrid.** Die Astrologie des JOHANNES KEPLER. Eine Auswahl aus seinen Schriften. 226 S. München, OLDENBOURG, 1926. ISIS

Reviewed by MAX CASPAR, *Deutsche Literaturzeitung*, 5, 1573-76, 1928.

Theobald, Dr. Ein venezianisches Patent GALILEO GALILEIS. *Beiträge zur Geschichte der Technik und Industrie*, 17, 24-29, 2 fig., 1927. ISIS

C. — *Natural Sciences.*

Harcourt, Robert (1574?-1631). A relation of a voyage to Guiana. Edited by Sir C. ALEXANDER HARRIS. London, Quaritch for the Hakluyt Society, 1928. ISIS

D. — *Medical Sciences.*

Cohen, Hk. De apotheek van een Rotterdamsch geneesheer in 1603. *Bijdragen tot de geschiedenis der geneeskunde*, 8, 179-184, 1928. ISIS

Feyfer, F. M. G. de. WILLIAM HARVEY (1578-1657). *Bijdragen tot de geschiedenis der geneeskunde*, 8, 119-43, 7 fig., 1928. ISIS

Goulard, Roger. Deux contrats d'apprentissage de compagnon-chirurgien. (1628, 1660). *Bulletin de la société française d'histoire de la médecine*, 22, 219-220, 1928. ISIS

Harvey, William. Exercitatio anatomica de motu cordis et sanguinis in animalibus. Facsimile of first edition, Frankfurt, 1628. Florence, R. LIER, 1928. ISIS

Harvey, William. Anatomical exercises. The first English text of 1653, newly edited by GEOFFREY KEYNES. London, the Nonesuch Press, 1928. ISIS

(Harvey, Wm.) The Harvey tercentenary. *Nature*, 121, 834-35, 1928. ISIS

Keynes, Geoffrey. A bibliography of the writings of WILLIAM HARVEY, M. D., discoverer of the circulation of the blood. (Edition limited to 300 copies.) XII + 68 p., 8 pl. Cambridge, University Press, 1928. ISIS

Scolten, Adrian. NICHOLAS TULP (1593-1674). *Medical life*, 35, 381-91, 1928. ISIS

Wallach, Emil. DESCARTES und HARVEY. *Archiv für Geschichte der Medizin*, 20, 301-6, 1928. ISIS

Wiberg, Julius. WILLIAM HARVEY. 1578-1657. *Ugeshrift for Lager*, 1928; No. 20. ISIS

E. — *Alia.*

Browne, Sir **Thomas**. Christian morals. The second edition, with the life of the author by SAMUEL JOHNSON. Edited, with an introduction and notes, by S. C. ROBERTS. Cambridge University Press, 1928. ISIS

Browne, Sir **Thomas**. The complete works of Sir THOMAS BROWNE. Newly edited in six volumes by GEOFFREY KEYNES. Vol. 1. : Religio Medici, Christian Morals, A letter to a friend. London, FABER and GWYER, 1928. ISIS

Forgue, E. THÉOPHRASTE RENAUDOT, créateur du journalisme en France. 32 p., 8 pl. h. t., MASSON, Paris, 1927. ISIS

Le n° 1 de la *Gazette* parut à Paris le 30 mai 1631. Indications précises sur la composition du journal, et données biographiques sur THÉOPHRASTE RENAUDOT (Loudun, 1586; Paris, 1653), qui joignait à son journal un bureau d'annonces d'emplois disponibles, un bureau de prêts sur gages, et un service de consultations médicales gratuites. L. G.

Gentile, Federico. PASCAL. Saggio d'interpretazione storico. 346 p., G. LATERZA and figli, Bari, 1927. ISIS

Plus qu'un essai d'interprétation historique, l'étude de F. GENTILE me semble être un essai d'interprétation psychologique vue à travers l'histoire, dans lequel l'auteur, regardant PASCAL à la lumière de MONTAIGNE, de DESCARTES, de MÉRÉ, le PASCAL savant et le PASCAL des Provinciales, des Pensées, montre un PASCAL se libérant peu à peu et devenant avant tout religieux, s'imprégnant de jansénisme, se plongeant dans le mysticisme. L. G.

Lloyd, James Hendrie. Sir THOMAS BROWNE and the witches. *Annals of medical history*, 10, 133-7, 1928. ISIS

XVIIth Century (second half).

A. — *Mathematics.*

Cajori, Florian. Sir ISAAC NEWTON on gravitation. *The Scientific Monthly*, 27, 47-53, 1928. ISIS

Rosenfeld, L. RENÉ-FRANÇOIS DE SLUSE et le problème des tangentes. *Isis*, 10, 416-34, 5 fig., 1928. ISIS

B. — *Physical Sciences and Technology.*

Bloch, Léon. Les théories newtoniennes et la physique moderne. *Rev. de métaphysique et de morale*, 35, 41-54, 1928. ISIS

Comment aux théories newtoniennes se rattachent la théorie d'EINSTEIN, et les conceptions de la mécanique ondulatoire de LOUIS DE BROGLIE. L. G.

Meldrum, Andrew Norman. The development of the atomic theory : (3) NEWTON's theory, and its influence in the eighteenth century. *Manchester Memoirs*, 55 (1910), No. 4, 15 p., 1910. ISIS

Rugani, Luigi. PIERO MARIA GABRIELI (1643-1705). *Riv. di storia d. sc. med. e natur.*, 18, 183-91, 1927. ISIS

Physicien, philosophe, mathématicien, botaniste, médecin, fondateur en 1691, de l'Académie physiocratique de Sienne. L. G.

C. — *Natural Sciences.*

Fosi, Vittoria. Identificazione dei « Lumaconi ignudi » di FRANCESCO REDI. *Rassegna di Studi Sessuali*, 8, 19-22, 4 fig., 1928. ISIS

Ovington, John (d. 1731). An essay upon the nature and qualities of tea (1699). Reproduced by permission of the owner of the original document, Mr. ARTHUR WILLIAMS. Preface by AUGUSTINE BIRRELL. XII + 39 p. London, Institute of Certificated Grocers, 1928. ISIS

Packard, Francis R. MARCELLO MALPIGHI. *Annals of medical history*, 10, 209-10, 1928. ISIS

Rostafinski, Josephus. Catalogi plantarum quae a. 1651 Varsaviae in hortis botanicis regis IOANNIS CASIMIRI colebantur, secundum conspectus hortulanorum BARTHOLOMEI GEI et IACOBI HAIC. Accedit catalogus tertius plantarum indigenarum quae circa Varsoviam nascuntur, auctore MARTINO BERNHARDO. Edidit et ambo priores in systema naturale redegit. (Editionum Collegii ad Historiam scientiarum mathem. - naturalium perscrutandam.. vol. 2) 100 p. Cracoviae, Sumptibus Academiae litterarum et scientiarum Polonae apud bibliopolam G. GEBETHNER et WOLFF, 1928. ISIS

D. — *Medical Sciences.*

Goulard, Roger. Dans l'intimité d'un maître-chirurgien briard du XVIIe siècle. *Bulletin de la société française d'histoire de la médecine*, 22, 173-8, 1928. ISIS

Apropos of CLAUDE TERRIER, appointed chirurgien-juré at Brie, 1674, died in 1679 at the age of 60.

Hollingsworth, Merill W. Blood transfusion by RICHARD LOWER

in 1665. Translated from the Latin. *Annals of Medical History*, 10, 213-25, 3 fig., 1928. ISIS

Keussen, Herm. Die Antwort der Kölner Medizinischen Fakultät (1675) an die Erfurter Fakultät in Sachen des Sylvianismus. *Historisches Jahrbuch*, 27, 537-40, München, 1927. ISIS

Larsell, O. OLOF RUDBECK the Elder (1630-1702). *Annals of Medical History*, 10, 301-13, 6 fig., 1928. ISIS

Lint, J. de. Comment JEAN DE DOOT, forgeron, s'opéra d'un calcul de la vessie. *Aesculape*, mars, 50-3, illustr., 1928. ISIS

Pitfield, Robert L. A short account of PEPYS' oculist, D'URBERVILLE, and his family. *Annals of medical history*, 10, 173-9, 1928. ISIS

Schilfgaarde, A. P. van. Een ziektegeschiedenis uit 1656. *Bijdragen tot de geschiedenis der geneeskunde*, 8, 172-8, portr., 1928. ISIS

E. — *Alia.*

Broadhurst, Jean. Peeps with PEPYS at hygiene and medicine. *Annals of medical history*, 10, 165-72, 1 fig., 1928. ISIS

(Petty, Sir William. 1623-1687). The PETTY papers; some unpublished writings of Sir WILLIAM PETTY. Edited from the Bowood papers by the MARQUIS OF LANSDOWNE. Two vols. London, CONSTABLE, 1927. ISIS

Sarton, George. SPINOZA. *Isis*, 10, 11-15, 4 pl., 1928. ISIS

Spinoza. The correspondence of SPINOZA. Translated and edited, with introduction and annotations by A. WOLF. 502 p. London, ALLEN and UNWIN, 1928. ISIS

Trew, Abdias (1597-1669). Grundriss der verbesserten Astrologie (Reform-astrologie). Ins Hochdeutsche übertragen von JOS. FUCHS. 190 S., 1 Abb. München, HUBER, 1927. ISIS

XVIIIth Century (whole and first half).

A. — *Mathematics.*

Du Pasquier, L. Gustave. LÉONARD EULER et ses amis. IX + 125 p. Paris, J. HERMANN, 1927. ISIS

Reviewed by T. L. HEATH, *Nature*, 121, 786-87, 1928.

B. — *Physical Sciences and Technology.*

Birk, Alfred. Die technische Verwaltung der österreischischen Reichsstrassen im 18. Jahrhundert. *Beiträge zur Geschichte der Technik und Industrie*, 2, 75-88, 1921. ISIS

Davis, Tenney L. The vicissitudes of BOERHAAVE's textbook of chemistry. *Isis*, 10, 33-46, 2 pl., 1928. ISIS

Davis, Tenney L. BOERHAAVE's account of PARACELSUS and VAN HELMONT. *Journal of Chemical Education*, 5, 671-681, 1928. ISIS

« The history of chemistry which stands at the beginning of BOERHAAVE's treatise on that science is perhaps the oldest history of chemistry (of chemistry as distinct from alchemy) which we have. BOERHAAVE was born but a few years after the appearance of « The Sceptical Chymist. » He was contemporary with STAHL but had no sympathy with the doctrine of phlogiston. He lived at a time when chemistry had recently become a well-recognized science in its own right. He actually talked with those who had talked with VAN HELMONT, and VAN HELMONT, who was born thirty-six years after the death of PARACELSUS, thought so highly of the founder of chemical medecine that he visited his haunts to learn all that he could about him. When BOERHAAVE tells us about these two men, one of the greatest physicians and chemists of all time is telling us about his two most eminent predecessors. »

Gardenghi, Giuseppe. Nel secondo centenario della scoperta del glutine (G. B. BECCARI, 1728). *Riv. di storia d. sc. med. e nat.*, 19, 36-42, 1928. ISIS

La découverte du gluten est due (1728) à GIACOMO BARTOLOMEO BECCARI (Bologna, 1682, 07, 25 — id., 1766, 01, 30). L. G.

Hennig, Richard. Aus der Geschichte des Blitzableiters. Zur Priorität der Franklinschen Erfindung des Blitzableiters. *Beiträge zur Geschichte der Technik und Industrie*, 16, 183-199, 1926. ISIS

« Die Verknüpfung der beiden Erfahrungen, dass Elektrizität in Metallen am liebsten ihren Weg sucht und dass Blitz und Donner offenbar als Entladung eines elektrischen Funkens angesprochen werden müssten, hat dann BENJAMIN FRANKLIN unzweifelhaft als Erster durchdacht, und sie führte ihn schliesslich zu dem gewaltigen, erfinderischen Gedanken, der in seinem eingangs erwähnten Brief an PETER COLLINSON vom 29. Juli 1750 niedergelegt ist. *Die Erfindung des ersten Blitzableiters kann* FRANKLIN *unter keinen Umständen abgesprochen werden.* Mit vollem Recht steht auf seinem Grabstein : *Eripuit coelo fulmen.* »

Triewald, Marten (1691-1747). Short description of the atmospheric engine. Published at Stockholm, 1734. Translated from the Swedish with foreword, introduction and notes. XII + 61 p., 1 pl., facs. Newcomen Society, Extra publication no. 1, London, 1928. ISIS

« The name of MARTEN TRIEWALD is known to all those who have studied the history of the steam engine, but very few have any acquaintance with his book on the subject. In the first place it is extremely rare, and, next, it is written in Swedish, a language that is not widely spread among students of the history of engineering. There are earlier descriptions of the NEWCOMEN engine, as by LEUPOLD, SWITZER, and WEIDLER, but TRIEWALD's book is the first publication devoted solely to the engine, and the author knew NEWCOMEN and his partner CAWLEY, or CALLEY, personnally; he had a practical knowledge of the engine and had put up more than one in this country. »

C. — *Natural Sciences.*

Gertz, Otto. LINNÉ i Lund, Föredrag i Kungl. Fysiografiska Sällskapet den 2 Dec. 1927. 22 p., Lund, 1928. ISIS

LINNÉ, the famous botanist, came to Lund on August 17, 1727, and obtained his first academic education at the university there. He stayed there only a year and went then to Upsala, where he finished his studies and where he took up the work which made him famous all over the world.

J. W. S. J.

E. — *Alia.*

Lenoir, Raymond. Les historiens de l'esprit humain. VII + 173 p., Paris, ALCAN, 1926. (12 fr.) ISIS

Reviewed by HÉLÈNE METZGER, *Isis*, 10, 501-2, 1928.

XVIIIth Century (second half).

B. — *Physical Sciences and Technology.*

Goethe, J. W. v. Beiträge zur Optik. Erstes Stück, 62 S., 27 Taf. Zweites Stück, 31 S., Taf. und Kupfer. Faksimilierte Ausgabe mit einem Nachwort (21 S.) von JULIUS SCHUSTER. Weimar, im Verlag des Industrie-Comptoirs, 1791 (bzw. 1792). Berlin, JUNK, 1928. ISIS

Goethe, J. W. v. Farbenlehre. 686 p., 31 colored pl. Leipzig, Insel-Verlag, 1928. ISIS

Leroux, Lucien et Désiré. LAVOISIER. (Nobles vies, grandes œuvres, 12). 125 p. Paris, PLON, 1928. ISIS

Lippmann, Edmund O. von. CAZAUD über den Anbau des Zuckerrohres (1781) (Aus der in Vorbereitung begriffenen Neuauflage der « Geschichte des Zuckers ».) Berlin, *Die Deutsche Zuckerindustrie*, Nr. 23, S. 629, Jahrg. 1928. ISIS

Meldrum, Andrew Norman. Two great Irish chemists. BRYAN HIGGINS (1737-1820) and WILLIAM HIGGINS (d. 1825). *The New Ireland Review*, p. 275, 350, 1909 (?). ISIS

Meldrum, Andrew Norman. The development of the atomic theory. (1) BERTHOLLET's doctrine of variable proportions. *Memoirs of the Manchester Philosophical Society*, vol. 54, no. 7, 1910. ISIS

Mieli, Aldo. ALESSANDRO VOLTA. Zur Gedenkfeier an seinen 100 jährigen Todestag. *Beiträge zur Geschichte der Technik und Industrie*, 17, 51-54, portr., 1927. ISIS

E. — *Alia.*

Newell, Lyman C. Count RUMFORD, scientist and philanthropist. *Science*, 68, 67-73, July 27, 1928. ISIS

Partington, J. R. The composition of water. (Classics of scientific method.) VIII + 106 p. London, BELL, 1928. ISIS
Reviewed in *Nature*, 121, 981, 1928.

Roe, Joseph W. ELI WHITNEY, 1765-1825. Der Erfinder der Baumwollentkernmaschine und der Schöpfer der austauschbaren Fertigung. *Beiträge zur Geschichte der Technik und Industrie*, 10, 155-174, 10 fig., 1920. ISIS

Schiffner, C. WILHELM AUGUST LAMPADIUS (1772-1842). *Beiträge zur Geschichte der Technik und Industrie*, 12, 40-50, 4 fig., 1922. ISIS

Schwemann, A. FRIEDRICH ANTON Frh. v. HEINITZ (1725-1802). Preussischer Bergwerksminister. Ein Lebensbild. *Beiträge zur Geschichte der Technik und Industrie*, 12, 159-172, portr., 1922. ISIS

C. — *Natural Sciences.*

Blaser, Julius. Gebirgsreisen in der Schweiz gegen Ende des 18. Jahrhunderts. Eine kulturgeschichtliche Skizze. *Die Alpen*, Monatsbericht des schweizer Alpenclub, 174-186; 201-13, 8 pl., Bern, 1926. ISIS

Brunet, P. GUÉNEAU DE MONTBÉLIARD (1720-1785). *Mém. de l'Acad. des sc., arts et belles-lettres de Dijon*, 125-31, 1925. ISIS

Coutinho, Gago. Travessia da Africa pelo Dr. LACERDA E ALMEIDA.

Boletim da agencia geral das colónias, Ano 3, no. 22, p. 59-83, Abril, 1927. ISIS

Conclusion of the series for which see *Isis*, 10, 181. J. K. W.

Gidon, F. Deux thèses de Caen sur la méthode de BERNARD DE JUSSIEU (1747 et 1778). *Bulletin de la société française d'histoire de la médecine*, 22, 179-184, 1928. ISIS

Hermannsson, Halldór. Sir JOSEPH BANKS and Iceland. (*Islandica*: vol. 18). x + 99 p., 27 pl. Ithaca, N. Y., Cornell University Library, 1928. ISIS

Jenkins, Pierre Gautier. ALEXANDER GARDEN, M. D., F. R. S. (1728-1791), colonial physician and naturalist. *Annals of Medical History*, 10, 149-158, 1928. ISIS

Klemm, Friedrich. MARTIN FROBENIUS LEDERMÜLLER (1719-69). Aus der Zeit der Salon-Mikroskopie des Rokoko. *Optische Rundschau*, Schweidnitz, Sonderdruck aus Nr. 45-48, 27 S., 11 Abb. im Text, 1927. ISIS

Mackenzie, Alexander. Voyages. Edited by JOHN W. GARVIN. (Master-works of Canadian authors, III) Five reproductions in sepia and seven pen-and-ink drawings by C. KEITH GEBHARDT. Map of MACKENZIE's routes. Toronto, The Radisson Society of Canada, 1928. ISIS

Schwemann, A. FRIEDRICH WILHELM Graf v. REDEN (1752-1814). *Beiträge zur Geschichte der Technik und Industrie*, 14, 22-39, portr., 1924. ISIS

D. — *Medical Sciences.*

Castaldi, Luigi. Un manoscritto di VINCENZO MALACARNE saluzzese sull'anatomia delle meningi. *Riv. di storia d. sc. med. e nat.*, 19, 62-72. ISIS

VINCENZO MALACARNE (Saluzzo, 1744; Padova, 1816), professeur de chirurgie à Pavie, puis à Padoue. L. G.

Crummer, Le Roy. Prefatory essay to An introduction to the study of physic by WILLIAM HEBERDEN. *Annals of Medical History*, 10, 226-241, 6 fig., 1928. ISIS

Ebstein, Erich. GOETHE's friend, the physician JOHANN CHRISTIAN EHRMANN (1749-1827). A character of Frankfurt. On the occasion

of the one hundredth anniversary of his death. (August 13, 1827) *Medical life*, 35, 392-94, portr., 1928. ISIS

Kissmeyer, Arne. ANNE-CHARLES LORRY (1726-1783) et son œuvre dermatologique. 64 p., 2 figs. Paris, Librairie LEGRAND, 1928. ISIS

Excellente petite monographie sur LORRY, tirant de l'oubli ce vrai fondateur de la science dermatologique. Recherches sur son système, fondé sur la médecine générale, et sur ses ouvrages, surtout son chef-d'œuvre *Tractatus de morbis cutaneis* (1777). Appendice contenant des notes bibliographiques sur les œuvres littéraires de LORRY. Préface du Dr. L. BROCQ, qui avoue que LORRY est le seul dermatologiste français qu'il n'ait pas étudié à fond, la plume à la main. J. W. S. J.

Koopman, J. Het genootschap, « Servandis civibus » (1778-1794). *Bijdragen tot de geschiedenis der geneeskunde*, 8, 215-20, 1928. ISIS

Mourgue, R. PAUL JOSEPH BARTHEZ (1734-1806). (Question 9). *Isis*, 10, 489, 1928. ISIS

Rivier, G. JEAN-JACQUES PAULET, praticien parisien. *Bulletin de la société française d'histoire de la médecine*, 22, 216-218, 1928. ISIS

Sharpless, William T. S. Dr. JOHN RUTTY (1698-1775) of Dublin and his « spiritual diary and soliloquies ». *Annals of Medical History*, 10, 249-57, 1928. ISIS

Szumowski, W. L'école médicale de Cracovie lors du dernier roi de Pologne. Communication faite au Vme Congrès International d'histoire de la médecine. 2 p. Geneva, A. KUNDIG, 1926. ISIS

E. — *Alia.*

Mathiez, Albert. The French revolution. Translated from the French by CATHERINE ALISON PHILIPS. New York, ALFRED A. KNOPF, 1928. ISIS

(Pestalozzi; 1746-1827). PESTALOZZI and his times. A pictorial record. Edited for the centenary of his death by the Pestalozzianum and the Zentralbibliothek, Zurich. 81 p., 165 pl. London, DENT, 1928. ISIS

Pestalozzi. Seine Zeit im Bilde. Zur 100. Wiederkehr seines Todestages hrsg. vom Pestalozzianum und der Zentralbibliothek in Zürich. Berichthaus, 1928. ISIS

Pfister, Christian. Les SCHWEIGHAEUSER et la chaire de la littérature

grecque de Strasbourg (1770-1855). Paris, Les Belles Lettres, 1928. ISIS

Wolfson, Harry Austryn. SOLOMON PAPPENHEIM (1740-1814) on time and space and his relation to LOCKE and KANT. Reprinted from the ISRAEL ABRAHAMS Memorial Volume, p. 426-40. Vienna, 1927. ISIS

XIXth Century (whole and first half).

A. — *Mathematics.*

Cajori, Florian. The chequered career of FERDINAND RUDOLPH HASSLER. Boston, Christopher Publishing House, 1928. ISIS

Lobachevsky, Nicholas Ivanovich (1793-1856). Ad annum MCMXXVI centesimum a geometra kazaniensi N. I. LOBACEWSKI noneuklideae geometriae systematis inventi concelebrandum. 110 p. Kazan, 1927. ISIS

Lobachevsky, Nicholas Ivanovich. In memoriam. Vol. II. 202 p. Kazan, 1927. ISIS

Walker, Helen M. The relation of PLANA and BRAVAIS to theory of correlation. *Isis*, 10, 466-84, 1928. ISIS

B. — *Physical Sciences and Technology.*

Arendt, Theodor. HEINRICH SAMUEL SCHWABE (1789-1875), der Entdecker der Sonnenfleckenperiode. Sein Leben und Wirken. 56 p., illus. Dünnhaupt Verlag, Dessau, (s. a., 1928?). ISIS

Beckmann, H. Zur Geschichte des Akkumulators und der Akkumulatoren-Fabrik Aktiengesellschaft. *Beiträge zur Geschichte der Technik und Industrie*, 14, 242-61, 28 fig., 1924. ISIS

Berdrow, Wilhelm. ALFRED KRUPP als Maschinenbauer. *Beiträge zur Geschichte der Technik und Industrie*, 14, 40-9, 7 fig., 1924. ISIS

Birk, Alfred. Die Geschichte des Suëzkanals. *Beiträge zur Geschichte der Technik und Industrie*, 13, 17-29, 2 fig., 1923. ISIS

Bolza, Albrecht. Die Erfindung der Druckmaschine durch FRIEDRICH KOENIG (1774-1833). *Beiträge zur Geschichte der Technik und Industrie*, 17, 1-23, 35 fig., portr., 1927. ISIS

Bone, William A. The centenary of JAMES BEAUMONT NEILSON's (1792-1865) invention of hot-blast in iron smelting. *Nature*, 122, 317-19, 1928. ISIS

Broglie, Louis de. La physique moderne et l'œuvre de FRESNEL. *Revue de métaphys. et de morale*, 34, 421-440, 1927. ISIS

Brownlie, David. JOHN GEORGE BODMER, his life and work, particularly in relation to the evolution of mechanical stoking. *Transactions of the Newcomen Society*, 86-110, 1926. ISIS

Born in Zurich, 1786; died there in 1864.

Buxbaum, Bertold. JOHANN GEORG BODMER (1786-1864). *Beiträge zur Geschichte der Technik und Industrie*, 12, 128-35, portr., 1922. ISIS

Dickmann, H. JOHANN GEORG LUDOLPH BLUMHOF (1771-1825) und seine Bedeutung für die Geschichte des Eisens. *Beiträge zur Geschichte der Technik und Industrie*, 17, 157-9, 1927. ISIS

Enderes, Bruno. Die « Holz- und Eisenbahn » Budweis-Linz, das erste Werk deutscher Eisenbahnbaukunst. *Beiträge zur Geschichte der Technik und Industrie*, 16, 13-64, 32 fig., 1926. ISIS

Ericsson, John (1803-1889). JOHN ERICSSON memorial. Brief biography by H. W. DICKINSON. *Transactions of the Newcomen Society*, 6, 201, 1926. ISIS

Fabry, Charles. La vie et l'œuvre scientifique d'AUGUSTIN FRESNEL. *R. Internat. de l'Enseignement*, 47, 321-45, 1927. ISIS

Fresnel, Augustin. Cérémonie du centenaire de la mort, à la Sorbonne, le jeudi 27 octobre 1927. 35 p. Académie des sciences. Paris, Palais de l'Institut, 1927. ISIS

Discours de MM. EMILE PICARD, H. A. LORENTZ, CHARLES FABRY.

Hall, John W. JOSHUA FIELDS' diary of a tour in 1821 through the Midlands, with introduction and notes. *Transactions of the Newcomen Society*, 6, 1-41, map, 1926. ISIS

JOSHUA FIELD, English constructor of marine engines, born in Hackney, 1787; died Balham Hill House, Surrey, 1863. G. S.

Hausbrand, Eugen. Von der Kupferschmiede zur Grossindustrie. Am Lebenswerk von CARL JUSTUS HECKMANN (1786-1878). *Beiträge zur Geschichte der Technik und Industrie*, 13, 61-88, 12 fig., 1923. ISIS

Honcamp, Franz. JUSTUS VON LIEBIG und sein Einfluss auf die Entwicklung der Landwirtschaft. Rektoratsrede. (*Rostocker Universitäts-Reden*, Band 6.) 8vo. 36 p. Rostock : Verlag Hinstorff, 1928. ISIS

(Liebig, Justus von). JUSTUS VON LIEBIGS Geburtshaus, Darmstadt, Grosse Kaplaneigasse. 20 S. Darmstadt, Druck von H. HOHMANN (1928). ISIS

Lotz, Heinrich. JOHN COCKERILL in seiner Bedeutung als Ingenieur und Industrieller 1790-1840. *Beiträge zur Geschichte der Technik und Industrie*, 10, 103-120, portr., 1920. ISIS

Matschoss, Conrad. FRIEDRICH HARKORT (1793-1880). Der grosse deutsche Industriebegründer und Volkserzieher. *Beiträge zur Geschichte der Technik und Industrie*, 10, 1-41, 4 fig., 1920. ISIS

Mayer, Max. EMIL KESSLER (1813-67) ein Begründer des deutschen Lokomotivbaues. *Beiträge zur Geschichte der Technik und Industrie*, 14, 216-241, 35 fig., portr., 1924. ISIS

Meldrum, Andrew Norman. AVOGADRO and DALTON. The standing in chemistry of their hypotheses. With a preface by FRANCIS R. JAPP. 113 p. Edinburgh, JAMES THINN, 1906. ISIS

Meldrum, Andrew Norman. GAY LUSSAC's Law, its centenary. *Nature*, 81, 519, 1909. ISIS

Meldrum, Andrew Norman. The development of the atomic theory : (2) The various accounts of the origin of DALTON's theory. *Manchester Memoirs*, 55 (1910), No. 3, 12 p., 1910. ISIS

Meldrum, Andrew Norman. The development of the atomic theory : (4) DALTON's physical atomic theory. *Manchester Memoirs*, 55 (1911), No. 5, 22 p., 1911. ISIS

Meldrum, Andrew Norman. The development of the atomic theory : (5) DALTON's chemical theory. *Manchester Memoirs*, vol. 55 (1911), No. 6, 18 p., 1911. ISIS

Meldrum, Andrew Norman. The development of the atomic theory : (6) The reception accorded to the theory advocated by DALTON. *Memoirs and proceedings of the Manchester Literary and Philosophical Society*, 55, No. 19, 10 p., 1911. ISIS

Meldrum, Andrew Norman. The rival claims of WILLIAM HIGGINS

(d. 1825) and JOHN DALTON. *Memoirs of the Manchester Philosophical Society*, 55, no. 22, 1911. ISIS

Meldrum, Andrew Norman. The development of the atomic theory. 13 p. London, Oxford University Press, 1919. ISIS

Nachtweh, Alwin. GEORG EGESTORFF (1802-68). *Beiträge zur Geschichte der Technik und Industrie*, 11, 197-206, 6 fig., 1921. ISIS

Naumburg, Robert E. Two American textile pioneers. *Transactions of the Newcomen Society*, 6, 149-58, 10 fig., 1926. ISIS

Apropos of CHARLES DANFORTH (1797-1876) and JOHN THORP (fl. 1812-44). G. S.

Oersted, Hans Christian (1777-1851). Experimenta circa effectum conflictus electrici in acum magneticam. *Isis*, 10, 435-444, 1928. ISIS

Facsimile reprint of this paper (Copenhagen, 1820) which marked the beginning of electromagnetism, also of the English translation in the *Annals of philosophy* (16, 273-76, London, 1820) With portrait of OERSTED and preface by GEORGE SARTON.

Rassow, B. JUSTUS LIEBIG als Förderer der chemischen Industrie. *Beiträge zur Geschichte der Technik und Industrie*, 13, 10-16, 1923. ISIS

Sanzin, R. Die Entwicklung der Güterzuglokomotive auf der Stockton-Darlington-Eisenbahn . *Beiträge zur Geschichte der Technik und Industrie*, 11, 63-74, 7 fig., 1921. ISIS

Smith, Edgar C. The centenary of the institution of civil engineers. *Nature*, 121, 867-868, 1928. ISIS

Söderbaum, Hendrik Gustav. Briefwechsel zwischen BERZELIUS und NILS NORDENSKIÖLD (1817-1847). 331 S., Bildnis von NORDENSKIÖLD. Uppsala, ALMQUIST, 1927. ISIS

Continuation of BERZELIUS's correspondence, the first part of which appeared in 1912; see *Isis*, 1, 555; 2, 275; 4, 155.

Staby, D. Die geschichtliche Entwicklung der Eisenbahnbremsen. *Beiträge zur Geschichte der Technik und Industrie*, 14, 1-21, 26 fig., 1924. ISIS

Sterner-Rainer, Roland. Zur Geschichte des Aluminiums und seiner leichten Legierungen. *Beiträge zur Geschichte der Technik und Industrie*, 14, 121-129, 1924. ISIS

Tyas, G. F. MATTHEW MURRAY (1765-1826). A centenary appreciation. *Transactions of the Newcomen Society*, 6, 111-143, portr., 1926. ISIS

C. — *Natural Sciences.*

Addison, William H. F. Centenary of the discovery of the mammalian ovum. *Medical Life*, 35, 67-74, 2 pl., 1928. ISIS

Apropos of CARL ERNST VON BAER's letter *De ovi mammalium et hominis genesi* addressed to the Imperial Academy of St. Petersburg (Leipzig, 1827).

Baer, Karl Ernst von. Über die Bildung des Eies der Säugetiere und des Menschen. Mit einer biographisch-geschichtlichen Einführung in deutscher Sprache. Hrg. von B. OTTOW. XXIV + 48 S., 1 Taf. Leipzig, Voss, 1927. ISIS

« Vor hundert Jahren führte KARL ERNST VON BAER in Königsberg jene bedeutungsvollen Untersuchungen aus, deren Ergebnisse in der vorliegenden Schrift niedergelegt sind. Im Druck erschien die Arbeit BAER's unter dem Titel *De ovi mammalium et hominis genesi* im Jahre 1828, wenngleich auch das Titelblatt das Jahr 1827 verzeichnet. Diese Arbeit gehört zu den klassischen Schriften auf dem Gebiete organischer Naturwissenschaft, denn die hier bekanntgegebene Entdeckung des tierischen Eies hatte grundlegende Bedeutung für die Naturforschung in ihrer Gesamtheit. »

Bashford, Herbert and **Wagner, Harr.** A man unafraid. The story of JOHN CHARLES FRÉMONT. 406 p., illus., pl., portr. San Francisco, HARR WAGNER Publishing Company, 1927. ISIS

Cormack, William Epps (1796-1868). Narrative of a journey across the island of Newfoundland in 1822. Edited by F. A. BRUTON. XVIII + 138 p. London, LONGMANS, 1928. ISIS

Originally published. St. John's, N. F., 1856.

Ferrero della Marmora, conte Alberto (1789-1863). Viaggio in Sardegna. Vol. 1. 409 p. Cagliari, Edizioni della fondazione « il Nuraghe » 1926. ISIS

First published in French, Paris, 1826.

Jewitt, John Rogers (b. 1783). Makwinnas Gefangener. Meine Abenteuer und Leiden bei den Indianern am Nutkasund. Aus den Englischen übersetzt und bearbeitet von ARNOLD JACOBI. (Alte Reisen und Abenteuer, 19.) 159 S., Taf. und Karten. Leipzig, BROCKHAUS, 1928. ISIS

Nevins, Allan. FRÉMONT. The West's greatest adventurer. Being a biography from many hitherto unpublished sources of General JOHN C. FRÉMONT, together with his wife, JESSIE BENTON FRÉMONT, and an account of the period of expansion which found a brilliant leader in the Pathfinder. In two volumes, Vol. I. IX + 344 p., pl., ports., maps, fasc. Vol. II. Bibliography, p. 715-23. New York, HARPERS 1928. ISIS

Raspail, Mme Xavier. La vie et l'œuvre scientifique de F. V. RASPAIL. XVI + 128 p., 6 portr., VIGOT frères, Paris, 1926. ISIS

Biographie traitée en panégyrique de FRANÇOIS VINCENT RASPAIL, botaniste (organisation des graminées) chimiste (fécule, graisses, arsenic), paléontologiste, physiologiste et homme politique (Carpentras, 1794, 01, 25-Arceuil, 1878, 01, 07). Bibliographie de 80 numéros des ouvrages de F. V. RASPAIL. L. G.

Spokes, Sidney. GIDEON ALGERNON MANTELL (1790-1852) surgeon and geologist. XV + 263 p., 7 pl. London, JOHN BALE, Sons and DANIELSSON, 1927. ISIS

D. — *Medical Sciences.*

Bast, Theodore H. KARL FREDRICK BURDACH, June 12, 1776- July 16, 1847. *Annals of medical history*, 10, 34-46, portr., 1928. ISIS

Buchanan, J. Arthur. (JEAN GUILLAUME AUGUSTE) LUGOL (1788-1851), his work and his solution. *Annals of medical history*, 10, 202-208, 1 portr., 1928. ISIS

Carvalho, Augusto da Silva. LAENNEC. *Jornal da Soc. das sciencias médicas de Lisboa*, 91, 37-71 portr., 1927. ISIS

La vie de LAENNEC, son œuvre; son influence en Portugal à partir de 1835. L. G.

Hollander, Bernard. The centenary of FRANCIS JOSEPH GALL (1758-1928). *Medical life*, 35, 373-80, 1928. ISIS

Jones, Harold W. and **Mackmull, Gulden.** The influence of JAMES BLUNDELL (1790-1877) on the development of blood transfusion. *Annals of medical history*, 10, 242-248, 7 fig., 1928. ISIS

Le Gendre, Paul. Opinions et caractère de P. A. PIORRY (1794-1879). A propos de son poème : « Dieu, l'Ame et la Nature. » *Bulletin de la Société française d'histoire de la médecine*, 21, 436-59, 1927; 22, 57-82, 1928. ISIS

Meek, Walter J. The beginnings of American physiology. *Annals of medical history*, 10, 111-125, 8 portr., 1928. ISIS

Taylor, Frances Long. CRAWFORD W. LONG and the discovery of ether anesthesia. Foreword by FRANCIS R. PACKARD. New York, PAUL B. HOEBER, 1928. ISIS

See *Isis*, 8, 781.

E. — *Alia.*

Carus, Carl Gustav. Von den Anforderungen an eine künftige Bearbeitung der Naturwissenschaften. Nachwort von ADOLF MEYER. 18 p. Hamburg, Staats- und Universitäts- Bibliothek, 1928. ISIS

Lecture delivered by CARUS at the first meeting of the Deutsche Naturförscher, Leipzig, Sept. 19, 1822 and then published in manuscript form. Now reprinted in honor of the ninetieth meeting of the same society, with an excellent postface by ADOLF MEYER. G. S.

Cournot, Augustin. Researches into the mathematical principles of the theory of wealth. Translated by NATHANIEL T. BACON. With an essay on COURNOT and mathematical economics and a bibliography of mathematical economics by IRVING FISHER. XXIV + 213 p. London, MACMILLAN, 1928. ISIS

Fauconnet, A. Note critiques et documentaires sur la « Société Schopenhauer » et ses travaux. *Rev. de métaph. et de morale*, 34, 549-57, 1927. ISIS

Kern, Hans. CARL GUSTAV CARUS als Philosoph. *Leopoldina*, 3, 127-45, 1928. ISIS

Walther, Johannes. CARL GUSTAV CARUS zum Gedächtnis. *Leopoldina*, 3, 113-126, 1928. ISIS

With portrait and bibliography.

XIXth Century (second half).

A. — *Mathematics.*

Bianchi, Luigi (1856-1928). Biographical notes by ALFREDO CONTI and GUIDO FUBINI. *Bollettino di Matematica*, 7, 89-97, portr., 1928. ISIS

Fais, Antonio (1841-1925). Pagine autobiografiche. Catania, SASSARI, 1925. ISIS

Klein, Felix. Vorlesungen über die Entwicklung der Mathematik im 19. Jahrhundert. Teil II. Die Grundbegriffe der Invariantentheory und ihr Eindringen in die mathematische Physik. Für den

Druck bearbeitet von R. COURANT und ST. COHN-VOSSEN. X + 108 p. JULIUS SPRINGER, Berlin, 1927. ISIS

Reviewed by H. WIELEITNER, *Isis*, 10, 505, 1928.

B. — *Physical Sciences and Technology.*

Betti, Mario. Notizie sullo scritto « Il museo di storia naturale e la facoltà di scienze fisiche e naturali di Firenze » del prof. UGO SCHIFF, con cenni biografici sull'autore. *Archeion*, 9, 81-6, portr., 1928. ISIS

UGO SCHIFF (Frankfurt a. M., 1834-Firenze, 1915). La notice de MARIO BETTI précède le travail cité de SCHIFF, dont la publication portera sur plusieurs fasc. de *l'Archeion*. L. G.

Boccardi, Jean. L'œuvre scientifique du Père ANGELO SECCHI (1818-1878). *Revue générale des Sciences*, 39, 393-98, 1928. ISIS

Boutaric, A. MARCELLIN BERTHELOT (1827-1907). 220 p., 1 portr. Paris, PAYOT, 1927. ISIS

Reviewed by L. G., *Isis*, 10, 71-3, 1928.

Bureau international des poids et mesures. Séance spéciale tenue à l'occasion du cinquantenaire de sa fondation, le mercredi 5 octobre 1927. Académie des sciences. 26 p. Paris, Palais de l'Institut, 1927 ISIS

Discours de MM. EMILE PICARD, CHARLES EDOUARD GUILLAUME, MAURICE BOKANOWSKI (ce dernier était Ministre du commerce et de l'industrie.).

Crompton, Rookes Evelyn Bell. Reminiscences. XV + 238 p., 8 pl. London, CONSTABLE, 1928. ISIS

Reviewed by A. RUSSELL, *Nature*, 122, 517-18, 1928.

Dickmann, H. Die Erfindung des Stacheldrahtes. *Beiträge zur Geschichte der Technik und Industrie*, 17, 161, 5 fig., 1927. ISIS

Dietz, R. FRIEDRICH SIEMENS und das Glas. *Beiträge zur Geschichte der Technik und Industrie*, 10, 55-65, 11 fig., 1920. ISIS

Dreger, Max. HERMANN GRUSON (1821-1895). *Beiträge zur Geschichte der Technik und Industrie*, 16, 65-93, 10 fig., 1926. ISIS

Duhem, Pierre. L'œuvre scientifique de PIERRE DUHEM. Ouvrage édité par la Société des Sciences Physiques et Naturelles de Bordeaux, 556 p. Bordeaux, 1928. ISIS

Freytag, L. HEINRICH GERBER (1832-1912). Altmeister der deutschen Eisenbaukunst. *Beiträge zur Geschichte der Technik und Industrie*, 10, 93-102, 10 fig., 1920. ISIS

Fuchs, Franz. Die Entwicklung der Hochfrequenztechnik. *Beiträge zur Geschichte der Technik und Industrie*, 17, 55-59, 6 fig., 1927. ISIS

Geyer, D. W. Beitrag zur Geschichte des elektrischen Hebezeuges. *Beiträge zur Geschichte der Technik und Industrie*, 16, 261-279, 9 fig., 1926. ISIS

Gieseke, D. HEINRICH V. STEPHAN (1831-97). *Beiträge zur Geschichte der Technik und Industrie*, 12, 51-60, 1922. ISIS

Guillaume, Ch. Ed. La création du Bureau international des poids et mesures et son œuvre. Ouvrage publié à l'occasion du cinquantenaire de sa fondation. VIII + 321 p., 129 fig., 1 pl. Paris, GAUTHIER-VILLARS, 1927. ISIS

VITO VOLTERRA : Préface; D. ISAACHSEN : Introduction historique; CH. ED. GUILLAUME : L'œuvre du Bureau international des poids et mesures; A. PÉRARD : Les idées actuelles sur la définition de l'unité de longueur; L. MAUDET; L'invariabilité de l'unité de masse, assurée par le kilogramme prototype; CH. VOLET : Quelques propriétés métrologiques des laitons; L. REVERCHON : Documents statistiques.

Hofmann, Joh. Val. Grundzüge der Körperlehre, einer Wissenschaft über die innere Beschaffenheit der (irdischen) Körper und die Vorgänge in denselben als Ursachen aller Erscheinungen der Aussenwelt. Populär dargetellt von Dr. J. V. HOFMANN. Nebst einem Anhang über das Verhältnis von Herrn Prof. KIRCHOFF's Aularede « Über das Ziel der Naturwissenschaften » (1865) und Dr. J. V. HOFMANN's Somatologie vom Jahre 1863. Von demselben posthum herausgeben von seinen Söhnen. Dresden, EMIL PAHL, 1926. VII + 80 p. (Price : $ 1.00 net from the son of the author, WILLIAM E. HOFMANN, 1849 Bronxdale Avenue, New York City). ISIS

This book contains three popular lectures delivered in 1870 by JOH. VAL. HOFMANN (a German private scholar who was not connected with a university) in exposition of the views which he had earlier set forth in his Somatologie oder Lehre von der inneren Beschaffenheit der Körper, Göttingen, 1863. It contains a polemical chapter in which evidence is given that KIRCHOFF adopted and put forward as his own, in 1865, the views which HOFMANN had set forth in his book. And it prints a letter, with facsimile, from Prof. CARL NAUMANN in acknowlegment of the dedication of the book to him.

HOFMANN speculated about the density of atoms and about the spaces between them, etc. He held that the purely mechanical theory of heat as then recently developed by MAYER, JOULE, THOMSON, and HELMHOLTZ is inade-

quate to account for the phenomena of physics and chemistry — and that the particular properties of the kind of matter which is involved must be taken into the reckoning. He was apparently the first to see the necessity for a special science — Somatology — which should develop from the same causes the phenomena of chemistry, of crystallography, and of physics. To that extent he laid the early foundations for the work of VAN DER WAALS, RICHARDS, BRAGGE, and BOHR. T. L. D.

Lorenz, H. Die wissenschaftlichen Leistungen FRANZ GRASHOFS (1826-93). *Beiträge zur Geschichte der Technik und Industrie*, 16, 1-12, 1926. ISIS

Matschoss, Conrad. Aus der Geschichte der Gasmaschine. N. A. OTTO, EUGEN LANGEN und die Entwicklung der Verbrennungsmaschine. *Beiträge zur Geschichte der Technik und Industrie*, 11, 1-38, 13 fig., 1921. ISIS

Nonnenmacher, G. Auz der Geschichte der rheinischen Dampfkesselindustrie. Die Pioniere des deutschen Wasserrohrkesselbaues. *Beiträge zur Geschichte der Technik und Industrie*, 15, 210-25, 18 fig., 1925. ISIS

Ostwald, Wilhelm. Lebenslinien. Eine Selbstbiographie. Drei Bde. Berlin, KLASING, 1926-1927. ISIS

Reviewed by ERNST BLOCH, *Isis*, 10, 74-80, 506-509, 1928.

Reitböck, Gottfried. Der Eisenbahnkönig BETHEL HENRY STROUSBERG (1823-1884) und seine Bedeutung für das europäische Wirtschaftsleben. *Beiträge zur Geschichte der Technik und Industrie*, 14, 65-84, portr., 1924. ISIS

Rotth, August. Die Brüder SIEMENS und die Wärme. *Beiträge zur Geschichte der Technik und Industrie*, 10, 42-54, 1 fig., 1920. ISIS

Rotth, August. Die Brüder SIEMENS und das Siemens-Martin-Verfahren. *Beiträge zur Geschichte der Technik und Industrie*, 11, 207-215, 1921. ISIS

Schmidt, W. CARSTEN WALTJEN (1814-1880). Ein Pionier der Bremer Industrie und des deutschen Schiffbaues. *Beiträge zur Geschichte der Technik und Industrie*, 14, 205-9, 2 fig., portr., 1924. ISIS

Schulz, Bruno. Die technische Entwicklung der Ölfeuerung. *Beiträge zur Geschichte der Technik und Industrie*, 16, 106-120, 13 fig., 1926. ISIS

Seidell, Atherton. The BERTHELOT centenary and the resulting

international efforts to advance chemistry. *Science*, 67, 497-499, 1928. ISIS

Taggart, Walter T. EDGAR FAHS SMITH. *Science*, 68, 6-8, 1928. ISIS

Thomälen, Ad. Elektrische Bahnen. Ihre Entwicklung bei der Gesellschaft SIEMENS und HALSKE im Zeitraum 1879 bis 1884. *Beiträge zur Geschichte der Technik und Industrie*, 11, 39-62, 9 fig., 3 portr., 1921. ISIS

Thomson, Elihu. The earliest dynamo. *Science*, 68, 268, 1928. ISIS

Voigt, H. Die Firma VOIGT und HAEFFNER. Das Werden eines Ingenieurs und eines Unternehmens zur Frühzeit der Elektrotechnik. *Beiträge zur Geschichte der Technik und Industrie*, 13, 30-60, 1923. ISIS

Weicker, W. Die Entwicklung des Freileitungs-Stützen-Isolators. *Beiträge zur Geschichte der Technik und Industrie*, 17, 60-71, 76 fig., 1927. ISIS

Wiley, H. W. Early GRAMME machines. *Science*, 68, 252-54, 1928. ISIS

Yarrow, Lady. ALFRED YARROW : his life and work. XII + 276 p., 78 pl. London, E. ARNOLD, 1928. ISIS

Reviewed in *Nature*, 122, 124-25, 1928.

Zambonini, Francesco. L'opera scientifica di QUINTINO SELLA. *Arch. di storia d. sc.*, 8, 459-64, 1927. ISIS

QUINTINO SELLA (1827-1884). Ingénieur des mines. Travaux de cristallographie : Studii sulla mineralogia sarda.

C. — *Natural Sciences.*

Borisiak, A. V. O. KOVALESKII, his life and works. Publications on the history of science, no. 5, 135 p., illustrated (in Russian) Academy of Sciences, Leningrad, 1928. ISIS

Biography of the great Russian palaeontologist VLADIMIR ONUFRIEVICH KOVALESKII (1842-83), who had already published a number of very valuable memoirs by the time of his premature death in 1883. Perhaps the best known of his works was the *Monographie der Gattung Anthracotherium Cuv.* und *Versuch einer natürlichen Classification der fossilen Hufthiere* (*Palaeontographica* vol. 22, 131-46, 1876). G. S.

Brie, Friedrich. Der Einfluss der Lehren DARWINS auf den britischen Imperialismus. (Freiburger Universitätsreden, 1) 26 p. Freiburg i. B., SPEYER und KAERNER, 1927. ISIS

Reviewed by R. ZAUNICK, *Mitt. zur Geschichte der Medizin*, 26, 306, 1927.

Cattell, J. McKeen. Early psychological laboratories. Address on the occasion of the inauguration of the Psychological Laboratory of Wittenberg College, Springfield, Ohio, October 21, 1927. *Science*, 67, 543-48, 1928. ISIS

(Darwin, Charles). Down House as a DARWIN Memorial. *Nature*, 122, 350, 1928. ISIS

Dostoievsky, A. A. (*edit.*) PETER PETROVITSH SEMENOV-TIAN-SHANSKY (1827-1914), his life and his work. 265 p., illus., bibliogr. Leningrad, Russian Society of Geography, 1928. (in Russian). ISIS

Reviewed in *Geographical Review*, 700, 1928.

Finger, Charles J. DAVID LIVINGSTONE, explorer and prophet. XII + 300 p., portr. London, ALLEN and UNWIN, 1928. ISIS

Haeckel, Walter. Das ERNST HAECKEL-Museum in Jena. Ein Gedenkblatt. 24 S., 12 Taf. Pritzwalk, AD. TIENKEN, (1927).

Harrison (Benjamin) of Ightham. A book about BENJAMIN HARRISON, of Ightham, Kent, made up principally of extracts from his notebooks and correspondence. Prepared for publication by Sir EDWARD R. HARRISON. XVI + 395 p., 12 pl. London, Oxford University Press, 1928. ISIS

Reviewed in *Nature*, 122, 391-92, 1928.

Hedin, Sven. Mein Leben als Entdecker. VIII + 403 S., 158 Abb., 15 Karten. Leipzig, BROCKHAUS, 1928. ISIS

Jacob, Charles. La vie et l'œuvre d'EMILE HAUG (1861-1927). *Revue générale des Sciences*, 39, p. 261-271, 1928. ISIS

D. — *Medical Sciences.*

Banting, William (1797-1878). Letter on corpulence, addressed to the public, London, 1863. *Science News-Letter*, 13, 407-8, 1928. ISIS

Beeson, B. Barker. JEAN MARTIN CHARCOT (1825-93). A summary of his life and works. *Annals of medical history*, 10, 126-132, 1928. ISIS

Coronedi, Giusto. Studio critico-storico sopra RANIERI BELLINI. Contributo alla storia della farmacologia in Italia e singolarmiente nella scuola medica fiorentina, dal 1847 al 1877. *Riv. di storia d. sc. med. e natur.*, 19, 1-36, 1928. ISIS

RANIERI BELLINI (Pisa, 1819, 06, 17-Firenze, 1878, 01, 12). Biobibliographie.

Diepgen, Paul. EMIL NOEGGERATH (1827-95) und die Gynäkologie in der zweiten Hälfte des 19. Jahrhunderts. *Archiv für Geschichte der Medizin*, 20, 198-232, 1928. ISIS

Faure, Jean Louis. GUYON et la chirurgie urinaire. *Aesculape*, mars 1928, 68-71. ISIS

Portraits de J. CIVIALE (1792-1867), J.C.F. GUYON (1831-1920), J. ALBARRAN (1869-1912).

Garrison, Fielding H. Two pictures of EMIL NOEGGERATH (1827-1895). *Annals of medical history*, 10, 210-11, 2 portr., 1928. ISIS

Goodman, Herman. LUCIUS DUNCAN BULKLEY (1845-1928). *Medical life*, 35, 399-403, 1928. ISIS

Levinson, A. The three MEIGS and their contribution to pediatrics. *Annals of medical history*, 10, 138-148, 4 fig., 1928. ISIS

Lundsgaard, K. K. K. ALBRECHT v. GRAEFE; 22.5 1828-22.5 1928. *Hospitals tidende*, 1928, no. 20. ISIS

Monks, George H. Selection from the medical writings and sayings of Dr. OLIVER WENDELL HOLMES. 29 p., 1 portr. Reprinted from the *Boston Medical and Surgical Journal*, 197, 1385-1394, 1928. ISIS

Obermeier, Otto (1843-73). Die Entdeckung von fadenförmigen Gegilden im Blut von Rückfallfieberkranken (1873), hrg. von HEINZ ZEISS. (*Klassiker der Medizin*, 31) 52 S. Leipzig, BARTH, 1926. ISIS

Ogata, K. OGATA KÔ-AN and AMORI (in Japanese). Osaka, 55 p., 1927. ISIS

Reviewed by YOSHIO MIKAMI, *Isis*, 10, 80, 1928.

Robinson, Victor. The life of ABRAHAM JACOBI. *Medical life*, 35, 214-258, 261-98, ill., 1928. ISIS

Robinson, Victor. ELIZABETH BLACKWELL. *Medical life*, 35, 310-333, 2 portr., 1928. ISIS

Robinson, Victor. MARY PUTNAM JACOBI. *Medical life*, 35, 334-353, 1 illust., 1928. ISIS

Thomsen, Oluf. BERNHARD BANG, 80 aar. *Politiken*, June 1928. ISIS

BANG was born on the 7-6, 1848. Dr. med., 1880. He took up the study of veterinary science in 1880, became Prof. in 1892. Director of the veterinary

high-school at Copenhagen 1900-01, then veterinary superintendent (physicus) for Denmark. Renowned for his studies in tuberculosis and in the infectious abortion of cows. His bust was unveiled in the garden of the high-school on Nov. 23. J. W. S. J.

Wiese, E. Robert. THEODORE BILLROTH (1892-94), scholar, musician, master surgeon. *Annals of medical history*, 10, 278-86, 1928. ISIS

E. — *Alia.*

Allote de la Fuye, M. JULES VERNE, sa vie, son œuvre. 294 p. Paris, SIMON KRA, 1928. ISIS

Biographie très attachante de ce conteur extraordinaire que fut JULES VERNE (Nantes, 1828, 02, 08 — Amiens, 1905, 04, 24), destiné par son père à être avoué, mais qui devint auteur dramatique, secrétaire de théâtre, agent de change, avant de se lancer dans le roman d'aventures et d'anticipations en 1863 avec « Cinq semaines en ballon ». J'ai moins goûté les résumés donnés ici de quelques uns des romans qui m'ont tant intéressé jadis. L. G.

Andler, Charles. NIETZSCHE et ses dernières études sur l'histoire de la civilisation. *R. de métaphys. et de morale*, 35, 161-91, 1928. ISIS

Etude de l'influence exercée sur la pensée de NIETZSCHE par SPINOZA, RENAN, GOBINEAU. L. G.

Barrère, Camille. Notice sur la vie et les travaux de LÉON BOURGEOIS (1851-1925). 35 p., portr. Académie des sciences morales et politiques. Paris, FIRMIN-DIDOT, 1928. ISIS

Fisher, H. A. L. PAUL VINOGRADOFF. A memoir. 74 p. Oxford, Clarendon Press, 1928. ISIS

Garçon, Maurice. VINTRAS, hérésiarque et prophète. XII + 194 p., EMILE NOURRY, Paris, 1928 ISIS

Un bel exemple de folie mystique collective liée à la vie de PIERRE EUGÈNE MICHEL VINTRAS (Bayeux, 1807-Lyon, 1875), aventurier devenu mystique, puis inspiré, thaumaturge, que la prison ne guérit pas, et qui ne cessa d'être un mystificateur. L. G.

Thomsen, Vilhelm Ludvig Peter (1842-1927). Memorial publication for the anniversary of his death. Essays on the history of science, no. 4, 78 p., portrait, (in Russian). Academy of Sciences of the U.S.S.R. Leningrad, 1928. ISIS

Contents: SERREI F. OLDENBURG: Preface; VASILII VLADIMIROVICH BARTHOLD: THOMSEN and the history of Central Asia; ALEKSANDR NIKOLAEVICH SAMOILOVICH: THOMSEN and Turcology; ALEKSANDR EVGENIEVICH PRESNIAKOV: THOMSEN about the oldest period of Russian history; V. A. BRIM: THOMSEN as a Germanist. G. S.

Tiberghien, Guillaume. Bibliographie de l'Œuvre de GUILLAUME TIBERGHIEN (1819-1901), par ALBERT TIBERGHIEN. 32 p. Bruxelles, Imprimerie l'Avenir, 1928. ISIS

Zulueta, Francis de. PAUL VINOGRADOFF, 1854-1925. *Law Quarterly Review*, April, 1928. London, STEVENS, 1928. ISIS

XXth Century

A. — *Mathematics.*

Peeters, P. (S. J.) Le R. P. HENRI BOSMANS (S. J.). *Rev. des Quest. scientif.*, 13, 201-14, 1928. ISIS

Etude biographique sur le Père HENRI BOSMANS (Malines, 1872, 04, 07-Bruxelles, 1928, 02, 03), de qui *Isis* a publié un travail sur l'Arithmétique de André TACQUET (8, 66-82), et analysé un grand nombre de mémoires relatifs à l'histoire des mathématiques. — *Cf.* l'étude de A. ROME (*Isis*, 12, 88-112). L. G.

Srikantia, B. M. SRINIVASA RAMANUJAN (1887-1920). *The American mathematical monthly*, 35, 241-245, 1928. ISIS

B. — *Physical Sciences and Technology.*

Bligh, N. M. The progress of the chemical theory and practice. Newly discovered chemical elements. *Scientia*, 43, 229-36, 1928; trad. franç., id., suppl., 86-92. ISIS

Humbert, Pierre. La statistique stellaire et les travaux de l'école suédoise. *R. des quest. scientif.*, 13, 244-55, 1928. ISIS

D'après les travaux de C.V.L. CHARLIER, directeur de l'observatoire de l'université de Lund, et ses collaborateurs : W. GYLLENBERG, G. MALMQUIST. S. D. WICKSELL.

C. — *Natural Sciences.*

Bateson, Beatrice. WILLIAM BATESON, F. R. S., Naturalist : his essays and addresses; together with a short account of his life. IX + 473 p., 4 pl. Cambridge, University Press, 1928. ISIS

Reviewed in *Nature*, 122, 339-40, 1928.

MacMillan, Donald Baxter. Etah and beyond; or, Life within twelve degrees of the Pole. With illustrations from photographs by the author. XIX + 287 p., pl., portr., maps. London, CHAPMAN and HALL, 1927. ISIS

D. — *Medical Sciences.*

Julliot, C. L. RENÉ QUINTON. 80 p. Editions Per orbem, Paris, 1926. ISIS

RENÉ QUINTON, 1866-1925. Critique d'art. Biologiste : *L'eau de mer, milieu organique*, MASSON, Paris, 1904. C'est de la théorie de QUINTON que dérive, d'abord appliquée par lui-même, puis très largement répandue, la thérapeutique par l'eau de mer en injections sous-cutanées. Un des pionniers de l'aviation, bien qu'il ne fut pas lui-même aviateur. L. G.

E. — *Alia.*

Bousquet, G. H. VILFREDO PARETO, sa vie et son œuvre. 230 p., 4 fig., facsimile. Paris, PAYOT, 1928. ISIS

Burlond, Albert. La pensée d'après les recherches expérimentales de H. J. WATT, de MESSER et de BÜHLER. 192 p. Biblioth. de philos. contempor., F. ALCAN, Paris, 1927. ISIS

Les recherches de ces trois savants se sont poursuivies, avec le concours de O. KÜLPE de 1902 à 1908 à Würzburg; elles ont été publiées dans les *Archiv für die gesamte Psychologie*, et ont suscité de nombreux travaux. « WATT a examiné le plus simple des phénomènes de l'idéation, l'évocation dirigée ou l'association logique; chez (A.) MESSER, c'est le jugement qui vient au premier plan, et chez (C.) BÜHLER l'intellection, c'est à dire l'un des problèmes les plus compliqués de la pensée. » L. G.

PART II.

HISTORICAL CLASSIFICATION.

Including only the items which could not be included in Part I — the fundamental (centurial) classification. Hence a student of Muslim science, for example, should not peruse simply the notes collected below under the heading « Islam », he should examine as well those included above under the headings VIIth century, VIIIth century, etc.

CONTENTS :

I. — *Antiquity* : 1. Antiquity (generalities); 2. Egypt; 3. Babylonia and Assyria; 4. Greece; 5. Rome.

II. — *Middle Ages* : 6. Middle Ages (generalities); 7. Byzantium.

III. — *Oriental Science and Civilization* : 8. Asia (generalities; Western Asia; Central Asia; Eastern Asia); 9. India; 10. China; 11. Japan; 12. Israel; 13. Iran; 14. Islam.

I. — ANTIQUITY

1. — ANTIQUITY (*generalities*).

Englert, Ludwig. Die gegenwärtige Situation der Forschung zur Geschichte der antiken Medizin. *Archiv für Geschichte der Medizin*, 20, 307-26, 1928. ISIS

Evans, Sir Arthur John. The palace of MINOS at Knossos. A comparative account of the successive stages of the early Cretan civilization as illustrated by the discoveries at Knossos. Vol II. In two parts. 844 p., 31 pl. London, MACMILLAN, 1928. ISIS

Halliday, William Reginald. Greek and Roman folklore. (Our debt to Greece and Rome series). XI + 154 p. London, GEORGE G. HARRAP, 1927. ISIS

Kamal, Prince Youssouf. Monumenta cartographica Africae et Aegypti, vol. 1, 107 p., portr. and 64 plates of maps printed in heliogravure. Cairo, 1926. (Private publication, no publisher named). ISIS

Only 100 copies of this sumptuous and very bulky publication (which measures 62 × 75 cm. !) were printed and none of them placed on sale. A high quality of paper was used; all the principal names in the letterpress appear in red. As a work of art the volume has no little value, but as a work of scholarship its utility is questionable. The author has reproduced a sequence of maps of Egypt, Africa, and of the oikoumene : modern scholars' hypothetical reconstructions of the maps of ancient geographers, historians, and poets of the epoch before PTOLEMY. We thus have : HOMER's conception of the known world as interpreted by J. H. VOSS in 1802; HERODOTUS' view of Egypt as interpreted by A. J. BOON in 1843; the geographical system of HIPPARCHUS as interpreted by F. J. GOSSELIN in 1803; ARTEMIDORUS' world map as interpreted by KONRAD MILLER in 1898; etc. To illustrate SALLUST's conception of geography the medieval « Sallust » maps are used. The works of modern scholarship which Prince YOUSSOUF KAMAL has so carefully reproduced for the most part date from the eighteenth and early nineteenth centuries. No critical student can accept these reconstruction of ancient maps as final. The letterpress consists of brief estimates of the significance of the various ancient writers in relation to the history of geography; excerpts with French translation are given from the texts, especially in so far as they relate to Africa. J. K. W.

Köhm, Josef. Zur Auffassung und Darstellung des Wahnsinns im klassischen Altertum. (Beilage zum Jahresber. der Hess. Gymnas. in Mainz 1927-28.) 32 p. Mainz, L. WILCKENS, 1928. ISIS

Kubitschek, Wilhelm. Grundriss der antiken Zeitrechnung. (*Handbuch d. Altertumswiss.* begr. von IWAN VON MÜLLER, neu hrsg. von

WALTER OTTO, I. Abtlg., 7. Tl.). VIII + 241 p. München, C. H. BECK, 1928. ISIS

Reviewed by R. LAQUEUR, *Deutsche Literaturzeitung*, 1122-1124, 1928, and by S. DE RICCI, *Journal des savants*, 293, 1928.

Nilsson, Martin P. The Minoan-Mycenaean religion and its survival in Greek religion. XXIII + 581 p., 4 pl. Lund, GLEERUP, 1928. ISIS

Rostovtzeff, Mikhail Ivanovich. A history of the ancient world, I, Orient and Greece, 418 p., 83 pl., II, Rome, 387 p., 95 pl. Oxford, Clarendon Press, 1926-27. ISIS

Reviewed by FRANZ CUMONT, *Journal des savants*, 305-14, 1928.

2. — EGYPT.

Almagià, Roberto. L'opera degli Italiani per la conoscenza dell'Egitto e per il suo risorgimento civile ed economico. Scritti di vari autori raccolti e coordinati. Parte prima. XI + 200 p. Roma, Provveditoriato Generale dello Stato-Libreria, 1926. ISIS

Reviewed in 36e *Bibliographie géographique*, p. 481.

Chaîne, Marius. La chronologie des temps chrétiens de l'Egypte et de l'Ethiopie. Historique et exposé du calendrier et du comput de l'Egypte et de l'Ethiopie depuis les débuts de l'ère chrétienne à nos jours, accompagnés de tables donnant pour chaque année, avec les caractéristiques astronomiques du comput alexandrin, les années correspondantes des principales ères orientales, suivis d'une concordance des années juliennes, grégoriennes, coptes et ethiopiennes avec les années musulmanes, et de plusieurs appendices. XV + 344 p. Paris, GEUTHNER, 1925. ISIS

Reviewed by J. B. CHABOT, *Journal des Savants*, 373, 1928.

Chronique d'Egypte. Bulletin périodique de la fondation égyptologique Reine Elisabeth. No 1, Décembre 1925; etc.; no 5, Décembre 1927. Bruxelles, Musées Royaux du Cinquantenaire. ISIS

Quoique cette *Chronique* n'ait aucune prétention scientifique, elle contient des informations abondantes sur les fouilles et autres travaux en progrès, et une bibliographie égyptologique et papyrologique qui parait fort complète. Elle est envoyée gratuitement aux membres de la Fondation et n'est pas mise dans le commerce. G.S.

Davies, Norman de Garis. Two Ramesside tombs at Thebes. With plates in colour by N. DE GARIS DAVIES, H. R. HOPGOOD, C. K. WILKINSON, the late NORMAN HARDY, and NINA DE GARIS DAVIES. New York, Metropolitan Museum of Art, 1927. ISIS

Gardiner, Alan H. Catalogue des caractères d'impression hiéroglyphiques égyptiens d'après les matrices appartenant à ALAN H. GARDINER. En deux dimensions 18 points et 12 points avec grandeurs intermédiaires. 45 p. Bruxelles, Edition de la Fondation Egyptologique Reine Elisabeth, 1928. ISIS

Griffith, F. Llewellyn. The teaching of AMENOPHIS, the son of Kanakht. Papyrus B. M. 10474. *Journal of Egyptian archaeology*, 12, 191-231, 1926. ISIS

Hurry, Jamieson B. IMHOTEP, the vizier and physician of King ZOSER, and afterwards the Egyptian god of medicine. Second edition, revised. London, Oxford University Press, 1928. ISIS

First edition 1926; *Isis*, 11, 215.

Junker, Hermann. Die Stele des Hofarztes IRJ. *Zeitschr. f. ägypt. Sprache und Altertumskunde*, 63, 53-70, 1927. ISIS

Reviewed by M. MEYERHOF, *Mitteilungen zur Geschichte der Medizin und der Naturwissenschaften*, 27, 336, 1928.

Keimer, Ludwig. The wisdom of AMEN-EM-OPE and the Proverbs of SOLOMON. *American Journal of Semitic Languages and Literatures*, 43, 8-21, October 1926. ISIS

Lagier, Camille. Autour de la Pierre de Rosette. 159 p., 11 planches. Bruxelles, Edition de la Fondation Egyptologique Reine Elisabeth, 1927. ISIS

Excellent compte rendu orné de beaux portraits des protagonistes : JEAN FRANÇOIS CHAMPOLLION, SILVESTRE DE SACY, THOMAS YOUNG, EMMANUEL DE ROUGÉ, FRANÇOIS CHABAS, LE PAGE RENOUF. Le manque d'index est déplorable. D'après GIUSEPPE GABRIELI (*Chronique d'Egypte*, n° 5, 105, 1927) il n'est pas exact que I. ROSELLINI et L. M. UNGARELLI aient pillé la grammaire copte et le travail sur les obélisques romains de CHAMPOLLION. G. S.

Mattirolo, Oreste. I vegetali scoperti nella tomba dell'architetto KHA e di sua moglie MIRIT nella necropoli di Tebe, dalla Missione archeologica italiana diretta dal Senatore E. SCHIAPARELLI. *Atti della Reale Acad. delle Scienze di Torino*, 61, 545-68, fig., 1926. ISIS

Mehmke, R. L. Beitrag zur Geschichte des Wasserbaus im alten Aegypten. *Beiträge zur Geschichte der Technik und Industrie*, 16, 280-89, 10 fig., 1926. ISIS

Menascha, Ibrahim. Die Geburtshilfe bei den alten Aegyptern. *Archiv für Gynäkologie*, 131, 425-461, 26 Abb., 1927. ISIS

Meyer, Eduard. Geschichte des Altertums. Band II., Abteilung I., Zweite Auflage, Die Zeit der Aegyptischen Grossmacht. XIV + 620 p. Stuttgart, J. G. COTTA, 1928. ISIS

Reviewed by A. T. OLMSTEAD, *American Historical Review*, 34, 95-97, 1928.

Möller, Georg. Die Metallkunst der alten Aegypter. Mit Literaturzusammenstellung und 48 Tafeln. 68 S. Berlin, ERNST WASMUTH, 1925. ISIS

Newberry, Percy Edward. Aegypten als Feld für anthropologische Forschung. Deutsch herausgegeben von GÜNTHER ROEDER. (*Der Alte Orient*, Bd. 27, H. 1). 38 p. Leipzig, HINRICHS, 1927. ISIS

Rey, Abel. Coup d'œil sur la médecine égyptienne. *Archeion, arch. di storia d. scienza*, 9, 10-29, 1928. ISIS

Après un rappel de ce qu'on pouvait penser de la médecine égyptienne avant l'étude du papyrus d'EDWIN SMITH par JAMES HENRY BREASTED, l'auteur examine le contenu du papyrus, et tire les conclusions qu'impose son ancienneté (*Isis*, 5, 447-9). L. G.

Schweinfurth, Georg. (1836-1925). Bibliographie de ses ouvrages. Extrait du *Bulletin de la Société royale de Géographie d'Egypte*, 14, 73-112, Le Caire, 1926. ISIS

Simpson, David Capell. The Hebrew Book of Proverbs and the Teaching of AMENOPHIS. *Journal of Egyptian Archaeology*, 12, 232-239, 1926. ISIS

Weill, Raymond. Bases, méthodes et résultats de la chronologie égyptienne. 216 p. Paris, GEUTHNER, 1927. ISIS

Reviewed by ETIENNE DRIOTON, *Journal des Savants*, 217-222, 1928.

Weynants-Ronday, Marie. Les statues vivantes. Introduction à l'étude des statues égyptiennes. Préface de JEAN CAPART. XI + 203 p. Bruxelles, Edition de la Fondation Egyptologique Reine Elisabeth, 1926. ISIS

Cette étude dépasse de beaucoup le domaine de l'égyptologie, car l'auteur a tâché d'expliquer la notion de *Ka* et les « statues de double » par une enquête approfondie dont elle a cherché les éléments dans le monde entier. Elle s'est surtout beaucoup servie du *Golden Bough* de FRAZER et du *Religious system of China* de J.J.M. DE GROOT. C'est une contribution importante à l'étude de l'idée d'âme. G. S.

Weynants-Ronday, Marie. Le Livre de Sagesse d'AMENEMOPE. *Chronique d'Egypte*, no. 3, p. 50-56, Bruxelles, octobre 1926. ISIS

Traduction du texte du papyrus 10,474 du British Museum. C'est un texte

de la XXI^e^ ou de la XXII^e^ dynastie, et il est probable que c'est bien un ouvrage de cette époque et non pas la transcription en néo-égyptien d'un ouvrage plus ancien. Voir ci-dessus les notes F. L. GRIFFITH, L. KEIMER, et D. C. SIMPSON. G. S.

Wreszinski, Walter. Bericht über die photographische Expedition von Kairo bis Wadi Halfa zwecks Abschluss der Materialsammlung für meinen Atlas zur altägyptischen Kulturgeschichte. (*Schriften der Königsb. Gelehrt. Ges.*, 4. Jahr, H. 2) VIII p. 19-105, 77 pl. Halle, MAX NIEMEYER, 1927. ISIS

3. — BABYLONIA AND ASSYRIA.

Desch, Cecil Henry. Report on the metallurgical examination of specimens for the Sumerian Committee of the British Association for the advancement of science, Glasgow meeting, 4 p. 1928. ISIS

Hall, H. R. Babylonian and Assyrian sculpture in the British Museum. 55 p., 60 pl. Paris, VAN OEST, 1928. ISIS

Meissner, Bruno. Könige Babyloniens und Assyriens. Charakterbilder aus der altorientalischen Geschichte. 314 p. Leipzig, QUELLE und MEYER, 1926. ISIS

Reviewed by B. LANDSBERGER, *Deutsche Literaturzeitung*, 1221-1223, 1928.

Neugebauer, O. Zur Geschichte des Pythagoräischen Lehrsatzes. *Nachr. Ges. Wiss. Gött., math.-phys. Kl*, 4 p., 1928. ISIS

Smith, Sidney. Early history of Assyria to 1000 B. C. (History of Babylonia and Assyria). XXVII + 418 p., pl., illus. London, CHATTO and WINDUS, 1928. ISIS

A continuation of LEONARD W. KING's History of Babylonia and Assyria.

4. — GREECE.

Calhoun, Georges Miller and Delamere, Catherine. A working bibliography of Greek law. With an introduction by ROSCOE POUND. XIX + 144 p. Cambridge, Mass., Harvard University Press, 1927. ISIS

« Most complete for the classical period. Titles arranged alphabetically in a single list. »

Geffcken, Johannes. Griechische Literaturgeschichte. Bd. I : Von den Anfängen bis auf die Sophistenzeit. Mit einem Sonderbd. : Anmerkungen. (*Bibl. der Klass. Altertumswiss.* hrsg. von J. GEFFCKEN.

Bd. 4.) XII + 328 S.; VII + 317 S. Heidelberg, C. WINTER, 1926. ISIS

Reviewed by ALFRED KÖRTE, *Deutsche Literaturzeitung*, 1354-1357, 1928.

Gomperz, Heinrich. Die Lebensauffassung der griechischen Philosophen und das Ideal der inneren Freiheit. 12 gemeinverst. Vorlesungen. Mit Anhang: Zum Verständnis der Mystiker. Dritte völlig umgearbeitete und erweiterte Auflage. VI + 322 p. Jena, DIEDERICH, 1904. ISIS

Hasebroek, Johannes. Staat und Handel im alten Griechenland. Untersuchungen zur antiken Wirtschaftsgeschichte. VIII + 200 S. Tübingen, J. C. B. MOHR (PAUL SIEBECK), 1928. ISIS

Reviewed by FRIEDRICH OERTEL, *Deutsche Literaturzeitung*, 5, 1618-1629, 1928.

Hasse, Helmut und **Scholz, Heinrich.** Die Grundlagenkrisis der Griechischen Mathematik. (Pan-Bücherei, Gruppe Philos., Nr. 3). 72 S. 8°. Charlottenburg, Pan-Verlag, K. METZNER, 1928. (Geh. 3.50 RM.) ISIS

Diese wertvolle Schrift ist einem seltenen Zusammenwirken mehrerer Hochschullehrer verschiedener Fächer an der Universtät Kiel entsprungen (auszer dem Mathematiker und dem Philosophen, die als Verf. zeichnen, noch dem Mathematiker O. TÖPLITZ und dem Altsprachler J. STENZEL). Der dem Titel entsprechende Aufsatz geht bis S. 27. Dann folgt bis S. 34 als Nachtrag eine Auseinandersetzung mit einem früheren Artikel von T. BONNESEN über denselben Gegenstand. Am Schlusz kommt ein « Anhang » beträchtlichen Umfangs von H. SCHOLZ (unter Mitwirkung von H. HASSE) « Warum haben die Griechen die Irrationalzahlen nicht aufgebaut? » Der erste Teil stellt in schärfster historischer und logischer Exaktheit den Aufbau der Verhältnislehre des EUDOXOS, bes. im Vergleich mit der Schnitt-Theorie DEDEKINDS dar. Im « Anhang » kommt Verf. zu der Antwort, dasz die Griechen durch das starre Identifizieren von « ganzer Zahl » und « Zahl » überhaupt schon nicht zu den « rationalen Zahlen » und daher auch nicht zu den Irrationalzahlen kommen konnten. H. W.

Herrmann, Aloys. Das Delische Problem. (Die Verdoppelung des Würfels.) (*Mathem.-Physik. Bibliothek*, Bd. 68.) 58 p. Leipzig, TEUBNER, 1927. ISIS

Lawrence, A. W. Later Greek sculpture and its influence on east and west. XVII + 157 p., 112 pl. London, JONATHAN CAPE, 1927. ISIS

Reviewed by L. D. BARNETT, *Journal Royal Asiatic Society*, 436-7, 1928.

Levi, Adolfo. La teoria stoica della verità e dell'errore. *Revue d'hist. de la philosophie*, 2, 113-132, 1928. ISIS

Lévy, Isidore. Recherches sur les sources de la légende de PYTHAGORE. 152 p. (*Biblioth. de l'Ecole des hautes études, sc. religieuses*, 42). Paris, ERNEST LEROUX, 1926. (30 fr.) ISIS

Reviewed by L. G., *Isis*, 10, 509, 1928.

Lévy, Isidore. La légende de PYTHAGORE de Grèce en Palestine 352 p. (*Bibl. de l'Ecole des hautes études, sc. histor. et philosoph.*, 252) Paris, H. CHAMPION, 1927. (75 fr.) ISIS

Reviewed by L. G., *Isis*, 10, 509, 1928.

Reitzenstein, Richard. Die hellenistischen Mysterienreligionen nach ihren Grundgedanken und Wirkungen. 3. erw. und umgearb. Aufl. VII + 438 S. Leipzig, TEUBNER, 1927. ISIS

Reviewed by MARTIN P. NILSSON, *Deutsche Literaturzeitung*, 5, 1649-1653, 1928.

Scoon, Robert. Greek philosophy before PLATO. VIII + 353 p. Princeton, University Press, 1928. ISIS

Swoboda, Heinrich (1856-1926). Epitymbion. HEINRICH SWOBODA dargestellt. XIV + 385 p. Reichenberg, STIEPEL, 1927. ISIS

Reviewed in *Journal des Savants*, 127, 1928.

Tarn, W. W. Hellenistic civilization. VIII + 312 p. London, ARNOLD, 1928. ISIS

5. — ROME.

Abbott, Frank Frost (1860-1924); **Johnson, Allan Chester.** Municipal administration in the Roman Empire. VII + 599 p. Princeton, University Press, 1926 ISIS

Reviewed by MAURICE BESNIER, *Journal des Savants*, 292-3, 1928.

Beyer, Oscar. Die Katakombenwelt. Grundriss, Ursprung und Idee der Kunst in der römischen Christengemeinde. 153 p., 30 pl., 17 fig. in text. Tübingen, MOHR, 1927. ISIS

Carcopino, Jérôme. Etudes romaines : la basilique pythagoricienne de la Porte Majeure. 414 p., pl. Paris, Artisan du Livre, 1926. ISIS

Cavaignac, Eugène. La paix Romaine. (Histoire du Monde) 492 p. Paris, BOCCARD, 1928. ISIS

Reviewed by TENNEY FRANK, *American Historical Review*, 34, 153, 1928.

Moinet, Paul. Au temps des Césars; médecine et chirurgie. 118 p., 1 pl., Soc., d'impressions typogr., Nancy, 1927. ISIS

L'auteur s'élève contre le préjugé tenace qui fait considérer comme des ignorants les médecins de la Rome antique, en passant en revue, très sommairement quelques célèbres médecins : A. MUSA, C. A. CELSUS, etc., leur clientèle (il s'occupe à ce point de vue à peu près uniquement des empereurs), leurs connaissances en médecine générale (d'après CELSE surtout), et en chirurgie (5 p. seulement). L'index bibliographique n'est qu'un trompe-l'œil.
L. G.

Rostovtzeff, Michael I. Mystic Italy. (The Colver Lectures, 1927, Brown University.) XXII + 176 p. New York, HOLT, 1927. ISIS

Reviewed by CLIFFORD H. MOORE, *American Historical Review*, 34, 101-2, 1928.

Wenger, Léopold. Der heutige Stand der römischen Rechtswissenschaft : erreichtes und estrebtes (*Münchener Beiträge zur Papyrusforschung und antiken Rechtsgeschichte*, XI). X + 113 p. München, BECK, 1927. ISIS

II. MIDDLE AGES.

6. — MIDDLE AGES (*generalities*).

Bonnerot, Jean. L'ancienne université de Paris, centre international d'études. *Bulletin of the international committee of historical sciences*, 1, 659-82, 1928. ISIS

Glossaria Latina jussu Academiae Britannicae edita. Vol. I. Glossarium Ansilenbi sive Librum Glossarum ediderunt W. M. LINDSAY, J. F. MOUNTFORD, J. WHATMOUGH, F. REES, R. WEIT, M. LAISTNER. Vol. II. Arma, Abavus, Philoxenus ediderunt W. M. LINDSAY, R. G. AUSTIN, M. LAISTNER, J. F. MOUNTFORD. Vol. III. Abstrusa, Abolita, ediderunt W. M. LINDSAY, H. J. THOMSON. Paris, Les Belles Lettres, 1926. ISIS

Reviewed by HENRI GOELZER, *Journal des Savants*, 220-25, 1928.

Hauberg, Poul. Salernoskolen og dens Indflydelse paa dansk medicinsk Literatur. (*Archiv for Pharmaci og Chemi*) 1928. ISIS

The old Danish medical literature was compiled from a great many sources. Among these the following Salernitans : GARIOPONTUS, PETRONCELLUS, CONSTANTINUS AFRICANIUS, BARTHOLOMEUS, TROTULA, ARCHIMATTHEUS, NICOLAUS SALERNITANUS, MATTHAEUS PLATEARIUS, JOHANNES FERRARIUS, BENVENUTUS GRAPHEUS, ROGER and GUALTERIUS AGULINUS. But also some of the anonymous Salernitan works were used : *Regimen sanitatis*, *Tractatus de aegritudinum curatione* and *Speculum medicorum*. J. W. S. J.

Hirschfeld, Ernst. Deontologische Texte des frühen Mittelalters. *Archiv für Geschichte der Medizin*, 20, 353-71, 1928. ISIS

Horwitz, Hugo Th. Technische Darstellungen aus alten Miniaturwerken. *Beiträge zur Geschichte der Technik und Industrie*, 10, 175-78, 7 fig., 1920. ISIS

Sarton, George. Tacuinum, Taqwîm. With a digression on the word almanac. (Answer 10) *Isis*, 10, 490-3, 1928. ISIS

Seyfert, Werner. Ein Komplexionentext einer Leipziger Inkunabel (angeblich eines JOHANN VON NEUHAUS) und seine handschriftliche Herleitung aus der Zeit nach 1300. *Archiv für Geschichte der Medizin*, 20, 272-99, 372-89, 1 Fig., 1 Taf., 1928. ISIS

Strecker, Karl. Einführung in das Mittellatein. 42 S. Berlin, WEIDMANN, 1928. ISIS

Reviewed by PAUL LEHMANN, *Deutsche Literaturzeitung*, 5, 1658-1661, 1928.

Thompson, James Westfall. Feudal Germany. XXIV + 710 p. Chicago, University of Chicago Press, 1928. ISIS

Reviewed by E. E., *American Historical Review*, 34, 104-6, 1928.

Thorndike, Lynn. Tacuinum (Question 10) *Isis*, 10, 489, 1928. ISIS

Wickersheimer, Ernest. La question du judéo-arabisme à Montpellier, *Janus*, 31, 463-73, 1927. ISIS

Contrairement à l'opinion courante, ni les Juifs, ni les Arabes n'ont contribué à la formation de l'école de Montpellier ; dans aucune des pièces par lesquelles il est possible de reconstituer le passé de la vieille université depuis sa fondation en 1220, il n'est cité un seul Juif, un seul Sarrazin. L. G.

Wickersheimer, E. Médecins et chirurgiens dans les hopitaux du Moyen Age. *Janus*, 32, 1-11, 1928. ISIS

Contrairement à l'opinion de K. SUDHOFF et de P. DIEPGEN, pour qui la France et l'Allemagne n'auraient eu de médecins attachés à leurs hopitaux qu'au début de XVIe S., WICKERSHEIMER tire d'archives des XIVe et XVe S. des documents qui montrent qu'en France du moins, des médecins et des chirurgiens étaient attachés à des établissements hospitaliers pendant le moyen âge : Hesdin, 1323, Saint Quentin, 1370, Argentan, 1405, Angers, 1432-62, Amiens, 1433-84, etc. L. G.

Willard, James F. Progress of mediaeval studies in the United States of America. Bulletin No. 6, 76 p. Published annually by the Mediaeval Academy of America and the University of Colorado, Boulder, Colorado, May 1928. ISIS

III. ORIENTAL SCIENCE AND CIVILIZATION.

8. — ASIA.

Western Asia.

Contenau, Georges. Manuel d'archéologie orientale, depuis les origines jusqu'à l'époque d'Alexandre. Volume I. Notions générales (races, chronologie, language, écriture, religion, etc.). Histoire de l'art (art archaique d'Elam et de Sumer). 545 p., 357 fig. ou similis dans le texte. Paris, PICARD, 1927. ISIS

Reviewed by S. RONZEVALLE, *Mélanges de l'université Saint-Joseph*, 12 225-247, 1927.

Macler, Frédéric. Trois conférences sur l'Arménie, faites à l'Université de Strasbourg. 144 p., 32 pl. (*Annales du Musée Guimet*, Bib. de Vulg., t. 46). Paris GEUTHNER, 1927. ISIS

Smith, Robert Payne. Supplement to the Thesaurus Syriacus. Collected and arranged by his daughter, J. P. MARGOLIOUTH. XIX + 345 p. Oxford, Clarendon, Press, 1927. ISIS

Reviewed by M. GASTER, in *Journal of the Royal Asiatic Society*, 697, 1928.

Wilson, Lieut.-Colonel Sir **Arnold T.** The Persian Gulf : an historical sketch from the earliest times to the beginning of the twentieth century. With a foreword by L. S. AMERY, XVI + 327 p., 32 ill., map. Oxford, Clarendon Press, 1928. ISIS

Central Asia.

Barthold, W. Turkestan down to the Mongol invasion. (Second edition). Translated from the original Russian and revised by the Author with the assistance of H. A. R. GIBB. XX + 514 p. For the Trustees of the E. J. W. GIBB Memorial. London, LUZAC, 1928. ISIS

David-Neel, Alexandra. My journey to Lhasa. Illustrated with many photographs taken by the author. London, HEINEMANN, 1927. ISIS

Reviewed by H. LESS SHUTTLEWORTH, *Journal Royal Asiatic Society*, 160-3, 1928.

Gavrilov, Michel. Les corps de métiers en Asie Centrale et leurs statuts (rissala). *Revue des Etudes Islamiques*, 209-30, 1928. ISIS

Huber, E. Die Einführung des Weinbaus in Chinesisch-Turkistan. *Die Umschau*, 31, 528-33, 13 fig., 1927. ISIS

Eastern Asia.

(Including works relative to the whole of Buddhist Asia, or to India, Central and Eastern Asia combined.)

Jochelson, Waldemar. Archaeological investigations in Kamchatka. Octavo, VIII + 88 p., 84 fig. and maps. 19 pl. Washington, D. C., Carnegie Institution of Washington, 1928. ISIS

« This book is based on the author's field work conducted in Kamchatka in 1910-1911. While no traces of paleolithic man himself were discovered in Siberia many skeletal remains of neolithic man were found. The relation of the Siberian tribes, in the past and present, to the population of the Caucasus, Turkestan, Mongolia, Korea, China and Japan is also discussed. Thirteen ancient sites were excavated in Kamchatka, and the archaeological remains consisting of numerous stone and bone artifacts, stone lamps and of a peculair kind of primitive pottery are comparatively described in this report. »

9. — INDIA

Geddes, Arthur. Au pays de Tagore. La civilisation rurale du Bengale occidental et ses facteurs géographiques. Préface de A. DEMANGEON. 235 p., 2 grav. dans le texte, 1 carte et 5 pl. hors texte. Paris, ARMAND COLIN, 1927. ISIS

Reviewed by G. REGELSPERGER, *Revue générale des Sciences*, 39, 345, 1928.

Grierson, Sir George Abraham. Linguistic survey of India. Vol. 1, Part 1 : Introductory. XVIII + 517 p. Calcutta, Government of India Central Publication Branch, 1927. ISIS

Excellent reviews, by R. L. TURNER, *Nature*, 121, 783-785, 1928, and in the *Journal of the Royal Asiatic Society*, 711-18, 1928.

Guérinot, A. La religion Djaïna. Histoire, doctrine, culte, coutumes, institutions. 351 p., 25 pl. hors texte. Paris, GEUTHNER, 1926. ISIS

Reviewed by J. BACOT, *Journal des Savants*, 234, 1928, and by L. D. BARNETT, *Journal of the Royal Asiatic Society*, 673-74, 1928.

Mookerji, Rasacharya Kaviraj Bhudeb. Rasa-Jala-Nidhi : or Ocean of Indian chemistry and alchemy. Compiled in Sanskrit, with English translation by the Author. Vol. 1. V + XV + VIII + 350 + V p. Vol. 2. II + 5 + 8 + 10 + 296 + 23 p. Calcutta, The Author, 41a Grey Street, n.d. (1927 ?). ISIS

Reviewed by E. J. HOLMYARD, *Nature*, 121, 703, 1928.

Nell, Andreas. Ceylon (Sinhalese) olas or book manuscripts on early medicines and how they were made. *Annals of Medical History*, 10, 293-96, 1928. ISIS

Schmidt, Richard. Die moderne Kunst des Singens und die altindische Atemtechnik. *Ephemerides orientalis*, no. 33, 1-12, Leipzig, HARRASOWITZ, 1928. ISIS

Singh, Avadhesh Narayan. On the Indian method of root extraction. *Bull. of the Calcutta mathematical society*, 18, 123-40, 1927. ISIS

« In the course of the present paper it will be shown that BHÂSKARÂCHÂRYA's method of extracting square roots is the same as CATANEO's (1546), and that it was given by the Indian mathematician ÂRYABHAṬA as early as 499 A. D. On the other hand, the method given by THEON OF ALEXANDRIA does not in the least resemble CATANEO's method. » Erroneous views on this subject have been published by G. R. KAYE and repeated by D. E. SMITH and F. CAJORI. The author discusses the question on the basis of the original texts quoted and retranslated by him. He ends his analysis as follows : « The ancient Greeks did not possess methods for the extraction of square and cube roots in any way resembling our present methods, so that, on the evidence at hand, one is forced to conclude that we are indebted to the ancient Indian mathematicians for our present methods of extracting square and cube roots, and that the methods were well known among the Indian mathematicians about 499 A. D., and there is every reason to believe that they were invented much earlier. » G. S.

Vogel, J. Ph. Annual bibliography of Indian archaeology for the year 1926. Published with the aid of the Government of Netherlands India. (Kern Institute — Leyden). X + 107 p., 12 pl. Leiden, BRILL, 1928. ISIS

This splendid bibliography, of which this is the first volume, does not deal only with India and Ceylon, but as well with Further India and adjoining territories (Central Asia, Far East). It is splendidly illustrated (12 plates). An introduction of 28 pages presumably written by the general editor, Dr. VOGEL (see *Isis*, 10, 234) calls attention to some of the outstanding excavations and publications. This is an excellent feature. Dr. VOGEL is assisted by two of his colleagues at the University of Leyden, N. J. KROM and J. H. KRAMERS and by a committee of honorary editors. May this volume be succeeded by many others. G. S.

10. — CHINA.

Hackmann, Heinrich. Chinesische Philosophie. (*Gesch. der Philos. in Einzeldarstellgn.* hrsg. von G. KAFKA, Abt. 1, Bd. 5.) 406 p., 1 pl. München, E. REINHARDT, 1927. ISIS

Reviewed by ALFRED FORKE, *Deutsche Literaturzeitung*, 899-902, 1928.

Hu, Suh. The development of the logical method in ancient China

by HU SHIH (SUH HU). 10 + 187 p. (*Thesis*, Columbia) Shanghai, Oriental Book Co., 1922. ISIS

Laufer, Berthold. Insect-musicians and cricket champions of China. 27 p., 12 pl., in photogravure. (Anthropology Leaflet, 22). Chicago, Field Museum of Natural History, 1927. ISIS

Reviewed by G. S., *Isis*, 10, 510-11, 1928.

Maspero, Henri. La Chine antique. (Histoire du Monde, edited by E. CAVAIGNAC, vol. 4.) XVI + 624 p. Paris, BOCCARD, 1927. ISIS

Reviewed by B. LAUFER, *American Historical Review*, 33, 903, 1928.

Mikami, Yoshio. Characteristics of Chinese mathematics (in Japanese). *Tôyô Gakuhô*, 15, 431-484; 16, 49-109, Tokyo, 1926. ISIS

Reviewed by DAVID EUGENE SMITH, *Isis*, 10, 80-2, 1928.

Suzuki, Daisetz Teitaro. Essays in Zen Buddhism. (First Series). London, LUZAC, 1927. ISIS

Reviewed by EDWARD J. THOMAS, *Journal Royal Asiatic Society*, 174-5, 1928.

11. — JAPAN.

(Japan, science) Scientific Japan, past and present. Prepared in connection with the third Pan-Pacific Science Congress, Tokyo, 1926. XII + 359 p., 47 pl., 3 maps. Tokyo, MARUZEN Co., 1926. ISIS

Reviewed by GEORGE SARTON, *Isis*, 10, 83-88, 1928.

Montandon, George. Au pays des Aïnou. Exploration anthropologique. 241 p., 115 fig., 3 cartes et 48 pl. Paris, MASSON, 1927.

Nitobé, Inazo. Le Bushidô. Trad. de CH. JACOB, préface de A. BELLESSORT. 266 p. Paris, PAYOT, 1927. ISIS

Otsuki, Nyoden. Shinsen Yôgaku Nempyô (Newly revised chronological table of Occidental learning in Japan). In Japanese. XVI + 158 p. Tokyo, 1927. ISIS

Reviewed by YOSHIO MIKAMI, *Isis*, 10, 82-3, 1928.

Tanakadate, A. Circumstances of introducing Roman characters to Japanese writing. *Bulletin des Relations Scientifiques* 3, 1-16, 1928. ISIS

Witte, Johannes. Japan zwischen zwei Kulturen. XII + 505 p. Leipzig, HINRICHS, 1928. ISIS

Reviewed by L. RIESS, *Deutsche Literaturzeitung*, 5, 1916-1920, 1928.

12. — ISRAEL

Baglioni, Silvestro. L'igiene sessuale nel Pentateuco. *Rassegna di studi sessuali*, 8, 1-8, 1928. ISIS

Blondheim, D. S. Les parlers Judéo-Romans et la Vetus Latina. Etude sur les rapports entre les traductions bibliques en langue romane des Juifs au moyen-âge et les anciennes versions. CXXXVIII + 247 p. Paris, EDOUARD CHAMPION, 1925. ISIS

Elaborate review by LUDWIG BLAU (of Budapest) in the *Jewish Quarterly Review*, 19, 157-182, 1928.

Dalman, Gustaf. Arbeit und Sitte in Palästina. Bd. I : Jahreslauf und Tageslauf. 1. Hälfte : Herbst und Winter. (*Schriften des Dtsch. Palästina-Inst.*, hrsg von G. DALMAN. 3. Bd., 1. Hälfte). XIV + 279 p., 37 fig. Gütersloh, C. BERTELSMANN, 1928. ISIS

Reviewed by LUDWIG KÖHLER, *Deutsche Literaturzeitung*, 1077-1079, 1928.

Heman, Carl Friedrich. Geschichte des jüdischen Volkes seit der Zerstörung Jerusalems. In 2., gekürzter und bis auf die Gegenwart fortgeführter Auflage hrsg. von O. von HARLING. 444 p. Stuttgart, Calwer Vereinsbuchhdlg., 1927. ISIS

Reviewed by W. STAERK, *Deutsche Literaturzeitung*, 1145-1146, 1928.

Sassoon, David S. The history of the Jews in Basra. *The Jewish quarterly review*, 17, 407-69, 5 ill., 1927. ISIS

14. — ISLAM

Alexander, Constance M. Baghdad in bygone days. From the journals and correspondence of CLAUDIUS RICH, traveller, artist, linguist, antiquary, and British resident at Baghdad, 1808-1821, XVI + 336 p. London, MURRAY, 1928. ISIS

Canaan, Taufiq. Muhammadan saints and sanctuaries in Palestine. Reprint from the *Journal of the Palestine Oriental Society*. VIII + 331 p. London, LUZAC, 1927. ISIS

Reviewed by R. P. DEWHURST in *Journal of the Royal Asiatic Society*, 693-94, 1928 and by LUDWIG KÖHLER in *Deutsche Literaturzeitung*, 1325-26, 1928.

Gautier, E. F. L'Islamisation de l'Afrique du Nord : les siècles obscurs du Maghreb. 432 p., ill. Paris, PAYOT, 1927. ISIS

Reviewed in *Geographical Review*, 514-16, July 1928.

Goichon, A. M. La vie féminine au Mzab. Etude de sociologie Musulmane. Préface de WILLIAM MARÇAIS, XIV + 345 p., 19 pl. Paris, GEUTHNER, 1927. ISIS

Menzel, Theodor. Der I. Turkologische Kongress in Baku. 26, II. bis 6. III. 1926. *Der Islam*, 16, 1-76, 169-228, 1927. ISIS

Mercier, Louis. La chasse et les sports chez les Arabes. Illustrations de l'auteur d'après des miniatures orientales. 256 p. Paris, MARCEL RIVIÈRE, 1927. (20 fr.) ISIS

Reviewed by GEORGE SARTON, *Isis*, 10, 511-13, 1928.

Migeon, Gaston. Manuel d'art musulman. II. Les arts plastiques et industriels. 2 vols. 440; 460 p., 462 fig. Paris, PICARD, 1927. ISIS

Ruska, Julius. Zur geographischen Literatur im islamischen Kulturbereich. *Geogr. Z.*, 33, 519-28, 589-99, 1927. ISIS

Smirnov, Vasili Dimitriyevich (1846-1922). A memoir, by N. K. DMITRIYEV, *Journal Royal Asiatic Society*, 408-10, 1928. ISIS

Russian student of Ottoman Turkish literature.

PART III.

SYSTEMATIC CLASSIFICATION.

Including only the material which could not be included in Parts I and II. Hence studies on Japanese astronomy or on XIIIth century astronomy are not classified below under astronomy, but above, respectively under Japan (in Part II) and XIIIth Century (in Part I).

The sections forming Part III are classified as follows:

I. *Science in general* : 15. Bibliography; 16. History; 17. Organization; 18. Philosophy.

II. *Formal sciences* (Knowledge of forms) : 19. Logic and Theory of Knowledge; 20. Mathematics; 21. Statistical methods.

III. *Physical sciences* (Knowledge of inorganic nature); 22. Mechanics ; 23. Astronomy; 24. Physics ; 25. Chemistry (Physico-chemistry, Industrial chemistry); 26. Technology.

IV. *Biological sciences* (Knowledge of organic nature) : 27. Biology (Generalities, « Natural history »); 28. Botany (Agronomy, Phytopathology, Palaeobotany); 29. Zoology.

V. *Sciences of the earth* (implying knowledge of both organic and inorganic nature): 30. Geodesy; 31. Geography and Oceanography ; 32. Geology, Mineralogy, Palaeontology, Mining ; 33. Meteorology, Climatology and Terrestrial Physics.

VI. *Anthropological and historical sciences* (Knowledge of man, past and present): 34. Anatomy; 35. Physical anthropology (anthropometry

and races of man); 36. Physiology (human and comparative); 37. Psychology (human and comparative) ; 38. Archaeology (generalities, methods); 39. Prehistory; 40. Ethnology (primitive and popular science); 41. Superstition and Occultism.

42. Economics (economic doctrines and history; commerce; transportation and communications); 43. Sociology, Jurisprudence and Positive Polity ; 44. History of Civilization (general history, historical methods, biography and chronology); 45. History of Art (Art and science; Iconography; Arts and crafts); 46. History of Language, Writing and Literature; 47. History of Morals (Moral organization of society); 48. History of Philosophy; 49. History of Religion (Science and religion).

VII. *Medicine* : 50. History, organization and philosophy of medicine ; 51. Epidemiology, History of special diseases. Public health and Social medicine; 52. History of hospitals and of medical teaching; 53. Pharmacy; Pharmacology; Toxicology.

VIII. *Education* (The methods of accumulating, imparting and diffusing knowledge); 54 Education (Generalities, Methods, Colleges, Universities) ; 55. Academies, societies, congresses, National and international organization of science; 56. Bibliography. (Methods, Libraries) ; 57. Museology (Museums and Collections).

IX. 58. Alia; 59. Errata.

The applied sciences are not disconnected from the pure sciences, but, as far as possible, the principles and applications of science are considered in the same section. However, applications based upon the principles of many sciences are dealt with separately (e. g., technology; medicine; education).

I. SCIENCE IN GENERAL

16. — HISTORY OF SCIENCE.

Archiv für Geschichte der Mathematik, der Naturwissenschaften und der Technik. *Isis*, 10, 57, 1928. ISIS

Barnes, Harry Elmer. The history of science, teaching and personalia. *Isis*, 10, 47-52, 1928. ISIS

(Binoux, Prix) Le prix de 1927 a été décerné à HENRI DAUDIN. *Isis*, 10, 58, 502-05, 1928. ISIS

Cittert, van. Historische Tentoonstelling van antieke, natuurkundige Instrumenten te Utrecht. *Bijdragen tot de geschiedenis der geneeskunde* 8, 147-148, 1928. ISIS

(History of Science Society). List of members of the history of science society elected from August 1, 1926 to July 31, 1927. *Isis*, 10, 7-10, 1928. ISIS

(History of Science Society). Report of the meeting and exhibition commemorating the bi-centenary of the death of Sir ISAAC NEWTON. *Isis*, 10, 333-37, 1928. ISIS

(History of Science Society). Proceedings of the council meeting of the History of Science Society. *Isis*, 10, 338-9, 1928. ISIS

Meyer, Adolf. Naturforschung und Naturlehre im alten Hamburg. VIII + 99 S., 8 Taf. Hamburg, Staats-Bibliothek, 1928. ISIS

Contents : I. Hamburger Naturforscher und ihre Werke. Eine biobibliographische Übersicht. (1) Das Zeitalter von JOACHIM JUNGIUS und die erste Blütezeit des Akademischen Gymnasiums. (2) Die Zeit der Naturtheologie und der Aufklärung, zugleich die zweite Blütezeit des Akademischen Gymnasiums. Anhang : Zeitschriften und Sammlungen. II. JOACHIM JUNGIUS' geistesgeschichtliche Gestalt. Abhandlung von ADOLF MEYER.

The first part contains valuable bio- and bibliographical notes on a number of men of science who were born or flourished in the great city of Hamburg. A splendid group of men ! Fine portraits of JOACHIM JUNGIUS, PAUL MARQUARD SCHLEGEL, JOHANN VAGETIUS, JOANN GEORG BÜSCH, J. A. H. REIMARUS. G. S.

Ruska, Julius. Forschungsinstitut für Geschichte der Naturwissenschaften in Berlin. Erster Jahresbericht. Mit einer wissenschaftlichen Beilage über die Aufgaben eines Forschungsinstituts für Geschichte der Naturwissenschaften. 24 p. Berlin, SPRINGER, 1928. ISIS

Sarton, George. Introduction to the history of science Vol. 1, From HOMER to OMAR KHAYYAM. XII + 839 p. (Carnegie Institution of Washington, Publication no. 376). Baltimore, WILLIAMS and WILKINS, 1927. ($ 10.) London, BAILLIERE, TINDALL and COX, 1927. (45 sh.) ISIS

Reviewed by J. BIDEZ : *Revue belge de philologie et d'histoire*, 7, 341, 1928; I. B. HART in *Science Progress*, Oct 1928, 363-66; by CHARLES H. HASKINS. *Isis*, 10, 88-92, 1928; by Graf CARL v. KLINCKOWSTROEM in *Unsere Welt* (20, 134-137, Bielefeld, 1928); by RAYMOND LENOIR in *Revue philosophique* (53, 310, 1928); by P. MASSON-OURSEL in *Mercure de France*, 15 août 1928, p. 148-150; by Dr. MIRCEARLIADE in *Cuvântul* (Buckarest, June 1928); by JULIUS RUSKA in *Der Islam*, 17, 364-65, 1928, See also *Isis*, 11, 234, 519.

Sarton, George. Medallic illustrations of the history of science. (First series : XIXth and XXth centuries). Fourth article. *Isis*, 10, 485-88, 4 pl. 1928. ISIS

Medals representing LEVERRIER, GULDBERG, ALEX. AGASSIZ, STOKES, and DUPIN.

Sarton, George. Twenty second critical bibliography of the history and philosophy of science and of the history of civilization (to May 1927). *Isis*, 10, 103-327, 1928. ISIS

Singer, Charles. From magic to science : essays on the scientific twilight. XIX + 253 p., 47 pl. London, ERNEST BENN, 1928. ISIS

Smith, G. Elliot. Conversion in science. *Nature*, 121, 750-53, 1928. ISIS

From the Huxley Memorial Lecture, delivered at the Royal College of Science, South Kensington, on May 4.

17. — ORGANIZATION OF SCIENCE.

(Internal organization is meant, see Isis 1, 195. *For external, national or international, organization, see section* 55).

Brauer, Ludolph. Ueber die Bedeutung freier Forschungsinstitute. *Beiträge zur Klinik der Tuberkulose und spezifischen Tuberkulose-Forschung*, 68, 671-679, 1928. ISIS

Zimmern, Alfred. Learning and leadership; a study of the needs and possibilities of international cooperation. 112 p. London, Oxford University Press, 1928. ISIS

18. — PHILOSOPHY OF SCIENCE.

Hellmund, Heinrich. Das Wesen der Welt. 1323 p. Zürich, Amalthea-Verlag, 1927. ISIS

Inhalt : 1. Erkenntniskritische Einleitung zur Metaphysik; 2. Die Metaphysik der Physik; 3. Die Metaphysik der Chemie; 4. Die Metaphysik der Biologie; 5. Die Metaphysik der Psychologie; 6. Die Metaphysik der Ethik; 7. Die Metaphysik der Soziologie; 8. Die Metaphysik der Politik; 9. Die Metaphysik der Geschichte; 10. Die Metaphysik der Religion; 11. Die Metaphysik der Pädagogik; 12. Die Metaphysik der Geschlechter; 13. Die Metaphysik der Aesthetik; 14. Die Metaphysik des Genius; 15. Die Metaphysic der Gegenwart; 16. Die Metaphysik des deutschen Wesens.

« Dieses Buch will nicht um jeden Preis original sein — sondern es will *wahr* sein. Es will wieder den Blick auf Dinge hinlenken, die sich infolge der Spezialisierung und Trennung der allgemeinen Aufmerksamkeit ganz entzogen zu haben scheinen, nämlich : auf das *Verbindende*, Gemeinschaftliche. Das Buch sucht zu zeigen, dass das *Gemeinsame tiefer sitzt* und mehr Wahrheitsgehalt in sich birgt als das Trennende — dass im Gemeinschaftlichen allein die Quellen allen Lebens und aller Werte wurzeln. Es strebt vom Gemeinsam-Wesentlichen aus eine Neu-Befruchtung, Verlebendigung und innige Verbindung aller Wissens- und Lebensgebiete an. Wer mit dieser Absicht einig geht, dem wird es, denke ich, etwas sagen. Das Buch sucht davon zu überzeugen, dass es ein gemeinsames Wesen, ein Unvergängliches, Unantastbares in allem Seienden *gibt* und dass dieses sich klar *aussprechen* lässt — nicht mit allgemeinen, verschwommenen Redensarten, sondern durch verstehendes und doch exaktes Eindringen in die Materie aller Wissensgebiete. Dies allein gilt ihm als das 'Metaphysische', 'Absolute'. Das Buch will die eine, in allem Sein enthaltene *Struktur der Welt* sichtbar machen — und zwar mehr als dies bis heute meines Erachtens geschehen ist — und auf diese Weise die exakte Wissenschaft mit demjenigen, dem sie sich bisher meist verschloss und entzog, mit dem Vereinigenden selbst streng

verknüpfen. Es sucht wissenschaftlich zu bleiben und doch dem Ewigen, Unzerstörbaren, das bisher meist nur gefühls- und ahnungsweise das Gemüt der Menschen erfüllte, einen sicheren Platz anzuweisen, von dem es sich nicht mehr vertreiben lässt. Es möchte, indem es *eine Orientierung über das Ganze der Welt* und seine immanente Gesetzlichkeit bietet, die beiden Seiten des menschlichen Geistes, die rationale und die irrationale, die sich bisher stets befehlen, miteinander zur Deckung bringen und untrennbar verschmelzen. Und darüber hinaus sucht es, praktisch, eben so etwas wie einen festen, sicheren Pol ins Leben hineinzustellen, an dem die verirrte, ruhelose Seele Wurzel zu schlagen vermag. »

Ritter, William E. and **Bailey, Edna W.** The organismal conception, its place in science and its bearing on philosophy. *University of California Publications in Zoology*, vol. 31, p. 307-58, 1928. ISIS

Part I : Place of the organismal conception in science. Cellular biology; protoplasmic physiology; genetical biology; respiratory biology; neural biology; endocrinology; psychology; sciences of inanimate nature. Part 2. Bearing of the organismal conception on philosophy.

Tannery, Paul (1843-1904). Mémoires scientifiques. Volume VIII. Philosophie moderne. 1876-1903. Edité par J. L. HEIBERG. XV + 413 p. Toulouse, EDOUARD PRIVAT, 1927. ISIS

Reviewed by GEORGE SARTON, *Isis*, 10, 92-4, 1928.

Wolf, Abraham. Essentials of scientific method. Second edition, revised and enlarged. 174 p. London, GEORGE ALLEN and UNWIN, 1928. ISIS

II. FORMAL SCIENCES
(Knowledge of Forms).

19. — LOGIC AND THEORY OF KNOWLEDGE.

Whitehead, A. N. and **Russell, Bertrand.** Principia mathematica. Second edition. Vol. II, pp. XXI + 742, Vol. III, pp. 491. Cambridge, University Press, 1927. ISIS

Reviewed by C. H. LANGFORD, *Isis*, 10, 513-19, 1928.

20. — MATHEMATICS.

Brauner, Ludwig. Wichtige Abschnitte in der Rechenmaschinen-Entwicklung. *Beiträge zur Geschichte der Technik und Industrie*, 16, 248-60, 9 fig., 1926. ISIS

Cajori, Florian. Mathematics in liberal education. A critical examination of the judgments of prominent men of the ages. 169 p. Boston. The Christpoher Publishing House, 1928. ISIS

This is essentially a collection of quotations from the writings of philosophers and scientists of all times dealing with the educational value of mathematics. Each group of quotations is followed by a summary. This selection is very rich and very eclectic; it contains adverse judgments, as well as favorable ones. This is completed by brief discussions and statistical summaries. The grand total is 603 judgments for, and 128 against, the high value of mathematical study in liberal education. (If professional mathematicians were excluded, the total vote would be 413 to 123). A very valuable little book. May it influence American educators and help them realize the fundamental importance of mathematical training. G. S.

Cajori, Florian. A history of elementary mathematics with hints on methods of teaching. Illustrated Japanese translation by K. OGURA and Y. IDE. 510 p., Tokyo, Sank do, 1928. (Five yen). ISIS

CAJORI's History of elementary mathematics was first published by MACMILLAN, New York, in 1897 (VIII + 304 p.); a revised and enlarged edition (VIII + 324 p.) was issued by the same publishers in 1917. It is that second edition which is here translated into Japanese, with the addition of notes by the learned translators. Dr. K. OGURA is an able mathematician, who is now the director of the Shiomi Laboratory of Osaba. A very remarkable feature of this translation is the abundant collection of well chosen illustrations : portraits, facsimiles, monuments, illustrating every aspect of the development of mathematics. Some of these illustrations were new to me ! This work, completed by an elaborate index, seems to have been done with considerable care. It is a very handsome volume which does credit to the publishers as well as to the authors. G. S.

Feldhaus, F. M. Rechenapparate mit Kugeln oder Knöpfen. 3. Euklid-Feldhaus-Beilage zur « Maschinen-Buchhaltung », S. 9-12, Zella Mehlis in Thuringen, Juni 1928. ISIS

Hamel, Georg. Ueber die philosophische Stellung der Mathematik. *Akad. Schriftenreihe der Techn. Hochsch. Charlottenburg*, Heft 1. 16 S. Verlag Studentenhaus Charlottenburg E. V., 1928. ISIS

In dieser Rektoratsrede (30. VI. 1928) vertritt HAMEL vor allem den Gedanken, dasz es notwendig erscheint, den Kant'schen Begriff der « reinen Anschauung » im Sinne der Friesschen Philosophie explizit durchzuarbeiten, um ein wirkliche Grundlage der Mathematik zu erhalten, welche weder die empirische Anschauung noch die Logik allein geben können. H. W.

Hancock, Harris. The analogy of the theory of KUMMER's ideal numbers with chemistry and its prototype in PLATO's concept of idea and number. *The American mathematical monthly*, 35, 282-290, 1928. ISIS

Junge, Gustav. Einführung in Wesen und Wert der Mathematik. (*Wissen und Wirken*, Bd. 56). 92 S. Karlsruhe, G. BRAUN, 1928. ISIS

Ein hübsches Büchlein, das sich besonders durch die starke Heranziehung der dem Verf. vertrauten griechischen Mathematik auszeichnet. H. W.

Löffler, E. Forschung und Schule. Denkmittel der Mathematik im Dienste anderer Wissenschaften. *Unterrichtsblätter für Mathematik und Naturwissenschaften*, 34, 225-34, 1928. ISIS

Loomis, Elisha Scott. The Pythagorean proposition. 214 p. Cleveland, Masters and Wardens Association of the 22nd Masonic District of the Most Worshipful Grand Lodge of Free and Accepted Masons of Ohio, 1928. ISIS

Reviewed by RALPH D. BEETLE, *The American mathematical monthly*, 35, 310-11, 1928.

Miller, G. A. Origin of our present mathematics. *Scientific Monthly*, 26, 295-98, 1928. ISIS

More than half of the mathematics of today has been developed since the beginning of the nineteenth century. These developments include a considerable part, but less than half, of what is commonly known as elementary mathematics.

Pastori, Maria. Le serie divergenti. *Period. di mat.* (4) 7, 302-320, 1928. ISIS

Smith, David Eugene. A source book in the history of mathematics. *The American mathematical monthly*, 35, 280-2, 1928. ISIS

Stammler, Gerhard. Der Begriff der Null und der negativen ganzen Zahlen. Ein Beitrag zur Grundlegung der Arithmetik. Im Anschlusz an den Aufsatz von W. KOPPELMANN : « Ist die Arithmetik ein logisch korrektes Lehrgebäude ? » *Ann. d. Philos.*, 7 S. 146-164 (1928). ISIS

Der Aufsatz von KOPPELMANN war im denselben *Annalen* Bd. VI, S. 28 ff. erschienen. Ihm gegenüber zeigt STAMMLER, dasz wenn man die ganz moderne Grundlegung der Arithmetik untersucht, sie sich als logisch völlig einwandfrei erweist. H. W.

Vries, Hendrik de. Die vierte Dimension. Eine Einführung in das vergleichende Studium der verschiedenen Geometrien. Ubers. nach der 2. Aufl. von RUTH STRUIK. (*Wiss. und Hypoth.*, 29) IX + 167 p., 35 fig. Leipzig, Berlin, B. G. TEUBNER, 1926. ISIS

Reviewed by H. HOPF, *Deutsche Literaturzeitung*, 1230-1231, 1928.

Wieleitner, Heinrich. Mathematische Quellenbücher. III. Analytische und synthetische Geometrie. VII + 90 S., 22 Abb. Berlin, O. SALLE, 1928. (Rm. 2.50) ISIS

I have said how good WIELEITNER's mathematical anthology was when I reviewed the first two parts (*Isis*, 11, 240). The third part, dealing with analytic and synthetic geometry is equally good. The first three extracts

are taken from APOLLONIOS. Then we make a jump of two thousand years to reach FERMAT. The rest of the book contains extracts from DESCARTES, FLORIMOND DE BEAUNE, F. VAN SCHOOTEN, DE LA HIRE, DE L'HOSPITAL, EULER, DESARGUES, PASCAL, PONCELET, MÖBIUS, STEINER. G. S.

III. PHYSICAL SCIENCES
(Knowledge of inorganic nature).

22. — MECHANICS.
(*Including celestial and atomical mechanics*).

Feld, Jacob. History of the development of lateral earth pressure theories. *Brooklyn Engineers' Club Proceedings*, 61-104, January 1928. ISIS

Contents : 1. Theories previous to 1773. 2. Development of the theory of the wedge of maximum pressure, 1773-1840, COULOMB to PONCELET. 3. Elementary and wedge theories disregarding the wedge of maximum pressure, 1773 to date. 4. Recent development of the theory of the wedge of maximum pressure, 1840 to date, REBHANN and WEYRAUCH. 5. Theory of the ellipse of stress, 1856, RANKINE. 6. Theory of the circle of stress, 1870, MOHR and WEYRAUCH. 7. Analytical stress theories, 1873, to date, LEVY, ST. VENANT and BOUSSINESQ. 8. Recent theories based upon the laws of energy, friction and elasticity. G. S.

Metz, André. Temps, Espace, Relativité. 211 p. (Science et philosophie). Paris, GABRIEL BEAUCHESNE, 1928. ISIS

Avec son talent habituel, l'auteur de cet excellent petit livre permet, aux personnes douées d'une bonne culture scientifique, sinon de pénétrer sans effort dans une théorie mathématique extrêmement difficile d'accès, du moins de se familiariser avec les nouvelles conceptions du temps, de l'espace, et de la masse qui résultent des doctrines de EINSTEIN et de ses disciples; ces conceptions qui ont parfois scandalisé ou tout au moins étonné grand nombre d'ignorants ou même de savants, se dépouillent, à mesure que l'on y réfléchit, de leur caractère rébarbatif, étrange ou paradoxal; et le lecteur de M. METZ qui n'a aucune qualité pour juger la valeur réelle de la relativité, encore discutée par quelques spécialistes, est du moins disposé à en accepter les principes, et cela sans révolte aucune. HÉLÈNE METZGER.

Michel, J. Mouvements perpétuels. Leur histoire et leurs particularités depuis les premières tentatives du XII[e] s. jusqu'aux engins des inventeurs modernes. VIII + 52 p., 82 fig., DESFORGES, GIRARDOT, Paris, 1927. ISIS

L'auteur, s'inspirant de ses prédécesseurs anglais, allemands (*Isis*, 3, 364), décrit plus ou moins sommairement 98 mécanismes chimériques qu'il groupe en : Mouvements perpétuels mécaniques, mouvements à circulation de fluide, mouvements magnétiques et électriques, et mouvements perpétuels divers (horlogerie à selfremontage, appareils à corps radioactifs, dispositifs

à air liquide). Le nombre des inventeurs de mouvements perpétuels est si grand que de 1855 à 1903, l'Angleterre aurait délivré 575 brevets pour machines à mouvements perpétuels. La brochure est malheureusement écrite en un très mauvais français. L. G.

23. — ASTRONOMY.

Bell, Louis. Notes on the early evolution of the reflector. *Proceedings of the American Academy of Arts and Sciences*, 57, 67-74, Boston, 1922. ISIS

Jeans, J. H. Astronomy and cosmogony. x + 420 p. London, Cambridge University Press, 1928. ISIS

24. — PHYSICS.

Bachelard, Gaston. Etude sur l'évolution d'un problème de physique : la propagation thermique dans les solides. 184 p., Paris, J. VRIN, 1927. ISIS

L'auteur suit la question de la propagation de la chaleur dans les solides, au triple point de vue expérimental, mathématique et philosophique, depuis les premiers travaux de NEWTON (1701) jusqu'à BOUSSINESQ, à travers GUILLAUME AMONTONS, S'GRAVESANDE, BOERHAAVE, RICHMANN, LAMBERT, BLACK, LAVOISIER, LAPLACE, BIOT, FOURIER, POISSON, DUHAMEL, LAMÉ, etc. Ce travail est une illustration de son *Essai sur la connaissance approchée* (*Isis*, 11, 522). L. G.

Buckley, H. A short history of physics. XI + 263 p. London, METHUEN, 1927. ISIS

Reviewed by A. G. C., *Nature*, 121, 823-24, 1928.

Disney, Alfred N. Origin and development of the microscope, as illustrated by catalogues of the instruments and accessories, in the collections of the Royal Microscopical Society, together with bibliographies of original authorities. In collaboration with CYRIL F. HILL and WILFRED E. WATSON BAKER. Preceded by an historical survey on the early progress of optical science by the editor. XI + 303 p., 36 fig., 30 pl. London, Royal Microscopical Society, 1928. ISIS

The historical introduction (152 p.) is divided as follows : 1. Earliest times to 1590; 2. Optical instruments erroneously attributed to the ancients. This is a summary of a French paper published by THOMAS HENRI MARTIN in *Boncompagni Bulletino* (vol. 4, 165-238, 1871); 3. Age of progress, 1591-1660; 4. Invention of telescope and of compound microscope. Early form of latter; 5. Bibliography; in many cases the salient original passages are given in extenso. « Part II is occupied with catalogues of the instruments, and accessories, together with bibliography of the original authorities in the Library of the Royal Microscopical Society. As will be seen from the special

Introduction to the Second part, the year 1850 has been selected as a suitable date for separating early from modern microscopes. This at once gives two groups, A and B, of instruments. The accessories fall into a group C, by themselves. » This is a very elaborate and useful work. Its value is still increased by abundant and well chosen illustrations. G. S.

Ewing, Sir James Alfred. A century of inventions. Supplement to *Nature*, 121, 947-55, 1928. ISIS

From the Thirty-fourth James Forrest Lecture, delivered before the Institution of Civil Engineers on June 4, 1928, on the occasion of the celebration of the centenary of its incorporation.

Hoppe, Edmund (1854-1928). Geschichte der Physik. (Handbuch der Physik, herausgegeben von H. GEIGER und KARL SCHEEL, vol. 1, p. 1-179). Berlin, JULIUS SPRINGER, 1926. ISIS

This work ought not to be confused with another by the same author, bearing the same title, and published in the same year — but in Brunswick. That other work, reviewed in *Isis*, 9, 571, was arranged according to topics; in this one, which is much shorter, the treatment is more strictly chronological. The book is divided as follows : 1. Antiquity down to 1600. This includes chapters on Babylonian and Egyptian, Greek and Arabic physics, and on physics in mediaeval Christian Europe. All this is dealt with in less than 27 pages ! II. Period 1600 to 1842. Divided into four sections : 1600 to 1727, 1727 to 1790, GALVANI to 1820, 1820 to 1842. In all, 98 pages, III. Period 1842-1895, 75 pages. This account has the same outstanding quality as the one published in Brunswick : the level of accuracy is remarkably high and the original sources are almost always quoted. It is followed by two short chapters : on physical literature (p. 180-86) by KARL SCHEEL, and on research and teaching by E. H. TIMERDING (187-208). There is an index of subjects, but not of proper names. G. S.

Millikan, Robert Andrews; Henry Gordon Gale, and **Charles William Edwards.** A first course in physics for colleges. XIII + 676 + XLII p., 583 fig., illustrations. Boston, GINN, 1928. ($ 3.72).

It is hardly necessary to recommend a textbook which has been produced under the supervision of R. A. MILLIKAN and has been severely tested by a number of teachers in actual classroom experience. But it will be of special interest to our readers to know that the students using it will obtain a fair amount of historical knowledge. For example, the abundant illustrations include portraits of the leading physicists. G. S.

Rohr, Moritz von. Aus der Geschichte der Brille, mit besonderer Berücksichtigung der auf der Greeffschen beruhenden Jenaischen Sammlung. *Beiträge zur Geschichte der Technik und Industrie*, 17, 30-50, 20 fig., 1927. ISIS

25. — CHEMISTRY, PHYSICO-CHEMISTRY, INDUSTRIAL CHEMISTRY.

Färber, Eduard. Die geschichtliche Entwicklung der Chemie. *Beiträge zur Geschichte der Technik und Industrie*, 14, 50-64, 1924. ISIS

Färber, Eduard. Aus der Geschichte der chemischen Holzverwertung mit besonderer Berücksichtigung der Zellstoffgewinnung *Beiträge zur Geschichte der Technik und Industrie*, 16, 121-132, 1926. ISIS

Geisler, Kurt W. Zur Geschichte der Spirituserzeugung. Unter besonderer Berücksichtigung der landwirtschaftlichen Brennereien. *Beiträge zur Geschichte der Technik und Industrie*, 16, 94-105, 7 fig., 1926. ISIS

Holmyard, Eric John. The great chemists. VI + 137 p., frontispiece. London, METHUEN, 1928. (3/6) ISIS

Popular account which is of special interest, because it is the first which pays sufficient attention to the Muslim chemists, of which the author has made a special study. There is even a (suppositious) portrait of JABIR in frontispiece ! Contents : (1) ancient times ; (2) JABIR ; (3) RAZI and IBN SINA ; (4) ROGER BACON ; (5) PARACELSUS ; (6) ROBERT BOYLE ; (7) GEORG ERNST STAHL ; (8) JOSEPH PRIESTLEY ; (9) ANTOINE LAURENT LAVOISIER ; (10) JOHN DALTON ; (11) AMEDEO AVOGADRO ; (12) Sir HUMPHREY DAVY ; (13) JUSTUS LIEBIG ; (14) FRIEDRICH AUGUST KEKULÉ ; (15) LOUIS PASTEUR ; (16) SVANTE ARRHENIUS ; (17) DMITRI IVANOVITCH MENDELÉEFF ; (18) Sir WILLIAM RAMSAY.

Janet, Charles. La structure du noyau de l'atome, considérée dans la classification périodique des éléments chimiques. 68 p., 3 pl. Impr. départementale de l'Oise. Beauvais, 1927. Essai de classification hélicoïdale des éléments chimiques. 104 p., 4 pl. id., 1928. ISIS

Komppa, Gust. Über ältere finnische Chemiker. *Zrschr. f. angew. Chemie*, 40, 1431-1434, 1927. ISIS

Reviewed by PAUL DIERGART, *Mitteilungen zur Geschichte der Medizin*, 27, 162, 1928.

Marchal, Germaine. Le Glucinium. L'historique de sa découverte, sa préparation et ses propriétés. *Revue générale des Sciences*, 39, 271-76, 1928. ISIS

Nakaseko, Rokuro. Sekai Kwagaku-shi (History of chemistry). V + 571 p., 31 photographs. Kyôto, KANIYA SHÔTEN, 1927. ISIS

Reviewed by MARCELLO MUCCIOLI, *Archeion*, 9, 379-82, 1928.

Newell, Lyman C. and Davis, Tenney L. Notable New England chemists. 16 p. portraits. Boston, 1928. ISIS

« This pamphlet was prepared by the Division of History of Chemistry, American Chemical Society. It was distributed to registered members of the Division at the Swampscott meeting of the Society, September 10-14, 1928. » Contains portraits and biographical sketches of fourteen chemists of New England from JOHN WINTHROP jr. to T. W. RICHARDS.

Partington, J. R. The composition of water. (Classics of scientific method, 4) VIII + 106 p., 10 fig., 6 pl. London, G. BELL, 1928. 1s. 6d.) ISIS

Contents : 1. Early views and experiments on water; 2. The researches of CAVENDISH; 3. CAVENDISH's apparatus; 4. The water controversy; 5. Analysis of water by LAVOISIER; 6. Synthesis of water by LAVOISIER; 7. PRIESTLEY's experiments on the reduction of oxides; 8. Synthesis of water by MONGE; 9. Composition of water by volume and weight : GAY-LUSSAC, HUMBOLDT; DUMAS, MORLEY; SCOTT; BURT and EDGAR; 10. Summary.

Plessner, Martin. Neue Materialien zur Geschichte der Tabula Smaragdina. *Der Islam*, 16, 77-113, 1927. ISIS

Schmieder, Karl Christoph (1778-1850). Geschichte der Alchemie. (1832) Herausgegeben und mit einer Einleitung versehen von FRANZ STRUNZ. 28 + X + 613 S. München-Planegg, BARTH, 1927. ISIS

Stones, G. B. The atomic view of matter in the XVth, XVIth, and XVII th centuries. *Isis*, 10, 445-65, 1928. ISIS

26. — TECHNOLOGY.

(*For mining, see* 32. *geology*; *for industrial chemistry*, 25. *chemistry*. *See also Arts and Crafts, under* 45).

Berndt, G. Die Entwicklung der Schraubengewinde. *Beiträge zur Geschichte der Technik und Industrie*, 14, 101-120, 12 fig., 1924. ISIS

Bethge, Karl. Aus der Zeit der alten Weinpressen. *Beiträge zur Geschichte der Technik und Industrie*, 14, 210-216, 6 fig., 1924. ISIS

Buxbaum, Bertold. Der amerikanische Werkzeugmaschinen- und Werkzeugbau im 18. und 19. Jahrhundert. *Beiträge zur Geschichte der Technik und Industrie*, 10, 121-154, 25 fig., 1920. ISIS

Buxbaum, Bertold. Der englische Werkzeugmaschinen- und Werkzeugbau im 18. und 19. Jahrhundert. *Beiträge zur Geschichte der Technik und Industrie*, 11, 117-142, 32 fig., 1921. ISIS

Clark, H. O. Notes on local technology. *Transactions of the Newcomen Society*, 6, 184-7, 1926. ISIS

East Anglian technology : Flint industry ; monumental brasses ; engineering ; millwrighting.

Däbritz, W. Entstehung und Aufbau des rheinisch-westfälischen Industriebezirks. *Beiträge zur Geschichte der Technik und Industrie*, 15, 13-107, 31 fig., 1925. ISIS

Daniloff, Serge. Some unusual American spinning wheels. *Transactions of the Newcomen Society*, 6, 144-48, 1926. ISIS

Döhner, O. H. Die Entwicklung der Mechanisierung bei der Herstellung von Eisen- und Stahldrähten. *Beiträge zur Geschichte der Technik und Industrie*, 14, 193-204, 10 fig., 1924. ISIS

(Engineering, History) Analytical bibliography of the history of engineering and applied science, Part IV. *Transactions of the Newcomen Society*, 6, 203-21, 1926. ISIS

Häneke, Hans. Die technischen Museen, 1927. *Beiträge zur Geschichte der Technik und Industrie*, 17, 153-4, 1927. ISIS

Häneke, Hans. Aus der Geschichte der Zylinderbohrmaschine. *Beiträge zur Geschichte der Technik und Industrie*, 17, 117-121, 12 fig., 1927. ISIS

Hassler, Friedrich. Aus der Geschichte Augsburgs, seiner Gewerbe und seiner Industrie. *Beiträge zur Geschichte der Technik und Industrie*, 14, 155-192, 10 fig., 3 portr., 1924. ISIS

Hausen, J. Die Geschichte der Papierindustrie auf der Jahresschau Deutscher Arbeit, Dresden, 1927. *Beiträge zur Geschichte der Technik und Industrie*, 17, 154-5, 2 fig., 1927. ISIS

Hendrichs, Franz. Die Lage der Solinger Schwertindustrie vor tausend Jahren. *Beiträge zur Geschichte der Technik und Industrie*, 15, 262-75, 3 fig., 1925. ISIS

Horwitz, Hugo Th. Die Entwicklung der Drehbewegung. *Beiträge zur Geschichte der Technik und Industrie*, 10, 179-95, 13 fig., 1920. ISIS

Horwitz, Hugo Th. Technische Darstellungen in Bilderhandschriften des 13. bis 17. Jahrhunderts. *Beiträge zur Geschichte der Technik und Industrie*, 11, 179-184, 7 fig., 1921. ISIS

Hough, Walter. Collection of heating and lighting ustensils in the United States National Museum. (*Smithsonian Institution, United*

States National Museum, Bulletin 141). VIII + 113 p., 99 pl. Washington, Government Printing Office, 1928. ISIS

This catalogue is magnificently illustrated by no less than 99 plates. It deals with torches, candles, and candlesticks, primitive lamps and others down to the gas lamps, heating devices. G. S.

Hough, Walter. Fire as an agent in human culture. XIV + 270 p. (*Smithsonian Institution, United States, National Museum*, Bull. 139) Washington, Government Printing Office, 1926. ISIS

Hulme, E. Wyndham. On the invention of English flint glass. *Transactions of the Newcomen Society*, 6, 75-85, 1926. ISIS

Jenkins, Rhys. Iron-making in the Forest of Dean. *Transactions of the Newcomen Society*, 6, 42-65, 1926. ISIS

Knowles, John A. The history of copper ruby glass. *Transactions of the Newcomen Society*, 6, 66-74, 1926. ISIS

Kammerer, (Prof.). Der Werkstoff im Kranbau. *Beiträge zur Geschichte der Technik und Industrie*, 14, 130-154, 34 fig., 1924. ISIS

Matschoss, Conrad. Technische Kulturdenkmäler. *Beiträge zur Geschichte der Technik und Industrie*, 17, 123-52, 92 fig., 1927. ISIS

Merz, Leopold. Die Geschichte des Feuerlöschwesens. *Beiträge zur Geschichte der Technik und Industrie*, 16, 162-82, 13 fig., 1926. ISIS

Moll, Friedrich. Holzschutz. Seine Entwicklung von der Urzeit bis zur Umwandlung des Handwerkes in Fabrikbetrieb. *Beiträge zur Geschichte der Technik und Industrie*, 10, 66-92, 1920. ISIS

Moll, Otto E. E., and Szymanski, H. Vorgeschichte des germanischen Schiffbaues. *Beiträge zur Geschichte der Technik und Industrie*, 11, 155-178, 22 fig., 1921. ISIS

Nasmith, Frank. Fathers of machine cotton manufacture. *Transactions of the Newcomen Society*, 6, 159-68, 1 fig., 1926. ISIS

Orth, Friedrich. Der Werdegang wichtiger Erfindungen auf dem Gebiete der Spinnerei und Weberei. *Beiträge zur Geschichte der Technik und Industrie*, 12, 61-108, 34 fig., 1922; 17, 89-105, 39 fig., 1927. ISIS

Peltzer, R. A. Geschichte der Aachen-Stolberger Messingindustrie.

Beiträge zur Geschichte der Technik und Industrie, 15, 196-209, 9 fig., 1925. ISIS

Pfeiffer, D. Die Schreibmaschine bis 1900. *Beiträge zur Geschichte der Technik und Industrie*, 14, 89-124, 30 fig., 1923. ISIS

Roe, Joseph Wickham. Aus der Geschichte der Amerikanischen Werkzeugmaschinen. *Beiträge zur Geschichte der Technik und Industrie*, 17, 106-116, 4 fig., 1927. ISIS

Two chapters translated from : English and American Tool-Builders, XV + 315 p. New York, McGRAW-HILL, 1926.

Rudd, W. R. The strangers in Norwich, a page in the history of our ancient textile industry. *Transactions of the Newcomen Society*, 6, 188-95, 1926. ISIS

Sommer, Fritz. Zur Geschichte der Solinger Klingen- und Waffenindustrie. Die Waffenfabriken Gebr. WEYERSBERG und CARL REINHARD KIRSCHBAUM in Solingen und ihr Einfluss auf die Herstellung von aufpflanzbaren Seitengewehren. *Beiträge zur Geschichte der Technik und Industrie*, 12, 109-123, 11 fig., 1922. ISIS

Turnbull, Alexander D. The STEVENS family, inventors and engineers. *Transactions of the Newcomen Society*, 6, 169-83, 1926. ISIS

IV. BIOLOGICAL SCIENCES

(Knowledge of organic nature).

27. — BIOLOGY

(*Generalities*, « *Natural History* »).

Cunningham, J. T. Modern biology. A review of the principal phenomena of animal life in relation to modern concepts and theories. XII + 244 p. London, KEGAN PAUL, 1928. ISIS

Daudin, Henry. Etudes d'histoire des sciences naturelles. I. De LINNÉ à JUSSIEU. Méthodes de la classification et idée de série en botanique et en zoologie (1740-1790). II + 264 p. II. CUVIER et LAMARCK. Les classes zoologiques et l'idée de série animale (1790-1830). XII + 460 + 338 p., Paris, ALCAN, 1926. ISIS

Reviewed by RAOUL M. MAY, *Isis*, 10, 502-5, 1928.

Donnan, F. G. The mystery of life. *Nature*, 122, 512-14, 1928. (See also editorial p. 501-03). ISIS

Fox, H. Munro. Selene : or sex and the moon. (Psyche miniatures, general series, no. 15.) 84 p. London, KEGAN PAUL, 1928. ISIS

Reviewed in *Nature*, 121, 981, 1928.

Franz, Victor. Ontogenie und Phylogenie. Das sogenannte biogenetische Grundgesetz und die biometabolischen Modi. ***Abhandl. zur Theorie der organ. Entwicklung***, Heft 3. 51 S., Berlin, J. SPRINGER, 1927. ISIS

Reviewed by ZAUNICK, *Mitteilungen zur Geschichte der Medizin*, 27, 175, 1928.

Needham, Joseph. Man a machine. English edition : in the ***Psyche Miniature series***, pp. 111, London, KEGAN PAUL, 1927 (2/6). American edition : in the ***New Science series***, pp. 103 New York, W. W. NORTON, 1928 ($1) ISIS

In 1927 Prof. EUGENIO RIGNANO published in the Psyche Miniature series an essay entitled « Man Not a Machine » in which he expounded his finalistic or general teleological views, applying them in particular to biology. Impressed by the fact that in 1748 JULIEN DE LA METTRIE had published his « Man a Machine » and that an anonymous reply to it had appeared in the following year entitled « Man More than a Machine, In Answer to a wicked and atheistical Treatise, written by M. DE LA METTRIE, and intitled Man a Machine », the present writer determined to repeat the eighteenth century controversy by putting in a counter-plea to RIGNANO's from the standpoint of exact biology. He accordingly ventured to place the following words on his title-page — « Man a Machine, in answer to a romantical and unscientific treatise by Sig. EUGENIO RIGNANO ». The manner in which he attempted to substantiate this assertion may be roughly understood from the following headings :

(1) The teleological aspect of living beings not so evident and striking as some suppose. It is suggested that to an unbiassed mind without preconceptions or attachments to one side or the other, living organisms seem by no means overwhelmingly purposive, but in some cases thoroughly mechanical.

(2) The teleological aspect of living beings not by any means unique or characteristic of them as opposed to the rest of nature. In this section it is argued that as living beings cannot because of their constitution and structure be separated from the inorganic world, there is no case for restricting teleology to them, but on the contrary what purposiveness they show is but a department of universal teleology. These arguments largely follow the lines made familiar by Prof. LAWRENCE J. HENDERSON.

(3) The teleological aspect of living beings not susceptible of quantitative formulation and therefore not germane to science. Here teleology and mechanism are treated, after the Kantian manner, not as two entities in nature external to and independent of conceiving minds, but as aspects in the full sense of the word, and aspects which cannot be fused. It is argued that science is best regarded as the continual trend towards the numerical and the quantitative and that if this is so, teleology cannot be admitted unless it wears a quantitative wedding garment. So far no one has even sketched out such an article

of apparel and reasons are given for believing it to be an impossible task.

(4) Finally, some discussion is given of the methodological importance of mechanism in science and its inadequacy everywhere else. The picture of the universe which we obtain through scientific effort is far from being accurate and does not represent the universe as it really is, but philosophy, religion, and art, are equally in the dark, and it is only by a harmonious combination of them in human character that we can hope to correct the distortions of each. One thing, at any rate, is clear, namely, that science aims at describing the world in an equation, and therefore that the more quantitative a statement is the more it is scientific. Finalism, teleology, purposiveness, and with it Sig. RIGNANO, are thus relegated to the domain of philosophy where they are, no doubt, of great value, for FRANCIS BACON's notice to quit still holds good, and the writer sees no likelihood of its ever being withdrawn.

Apart from this main discussion the two first chapters are concerned with historical material concerning JULIEN DE LA METTRIE, his opinions and his writings. J. N.

Needham, Joseph. Organicism in biology. Reprinted from the January number of *The Journal of philosophical Studies*, 3, 29-40, 1928. ISIS

« The word 'Organicism,' although it may seem unfamiliar to the younger generation of biologists, is not a new one, and has been heard of already in that shadowy limbo where philosophical and biological conceptions meet on common ground. The genius of its original minting is not known, but it figured largely in the great work of YVES DELAGE, the French zoologist, in which he attempted to survey and criticize every important biological theory which had ever been seriously produced. His *L'hérédité et les grands problèmes de la biologie* appeared in 1903, and in it he classified all biological theories, past, present, and future, under the four heads of ‚Animism,' 'Evolutionism,' 'Micromerism,' and ‚Organicism,' an arrangement which seems to us now more than a little illogical... »

...« It is our property to live in several worlds at once, and of these we know at least three : one, where everything can be analysed and abstracted into the form of equations, and where Man is a Machine; another where entities have an individuality which evaporates when they are dissected, and Man is an Organism; and a third where the notion of the 'General Concourse' can still be taken seriously, and Man is a child of God and an Inheritor of the City of Haeven. »

Needham, Joseph. Recent developments in the philosophy of biology. *The Quarterly Review of Biology*, 3, 77-91, 1928. ISIS

« There is indeed all the difference in the world between pushing mechanistic explanation as far as it will go with the realization that it will go all the way but will not entirely satisfy you when you have got there, and diluting it with other (qualitative) sorts of explanation, in the hope that the mixture will afford you full satisfaction. It is this latter process that is being given up in biology. Scientific explanation and philosophical explanation are two distinct foods of the soul, and they are confused only at great peril. »

28. — BOTANY.

(*Agronomy, Phytopathology, Palaeobotany*).

Horwitz, Hugo Th. Geschichte der Schokolade and Schokoladeindustrie. *Beiträge zur Geschichte der Technik und Industrie*, 13, 125-45, 1923. ISIS

Leclerc, Henri. Les légumes de France. Leur histoire, leurs usages alimentaires, leurs vertus thérapeutiques. 217 p. Paris, MASSON, 1928. ISIS

Reviewed by LAIGNEL-LAVASTINE, *Bulletin de la société française d'histoire de la médecine*, 22, 221-22, 1928.

Lindley Library: catalogue of books, pamphlets, manuscripts, and drawings. VIII+488 p. London, Royal Horticultural Society, 1927. ISIS

Peters, Hermann (d. 1920). Aus der Geschichte der Pflanzenwelt in Wort und Bild. Hrg. von der Gesellschaft für Geschichte der Pharmazie. 176 S. Mittenwald in Oberbayern, ARTHUR NEMAYER, 1928. ISIS

Posthumous publication, with a preface by GEORG URDANG, the congenial author of « Der Apotheker im Spiegel der Literatur » etc. There are thirty chapters including one each on safron, mandrake, poppy, olive, cypress, etc. This publication is a desirable supplement to « Aus pharmaceutischer Vorzeit » and will be welcomed by all lovers of the Scientia amabilis, whether they be botanists, pharmacists, physicians, or merely lovers of nature and literature. E. K.

Porteous, Alexander. Forest folklore, mythology, and romance. 319 p. London, ALLEN and UNWIN, 1928. ISIS

Forests of Eld; fabulous forests; forestry; groves; mythical denizens of the forests and woods; trees; folklore, legendary.

Rübel, Eduard. The present state of geobotanical research in Switzerland. *Beiblatt zu den Veröffentlichungen des Geobotanischen Instituts Rübel in Zürich*, No. 4, 46 p. Bern, HANS HUBER, 1928. ISIS

Contains a brief historical sketch of Swiss phytosociological research. Paper read at Ithaca, N. Y., in 1926.

Singer, Charles. The herbal in antiquity. *Journal of Hellenic Studies*, 47, 52 p., 10 colored plates and 46 fig. London, 1927. ISIS

Reviewed by G. S., *Isis*, 10, 519-21, 1928.

29. — ZOOLOGY.

Digby, Bassett. The mammoth and mammoth-hunting in northeast Siberia. 224 p., photographs, map. London, WITHERBY, 1926. ISIS

This is an account of the finds of fossil ivory and of mammoths in Siberia together with the author's personal experiences in the course of a similar quest. The first tidings of Siberian mammoths were brought to England in 1611, by JOSIAS LOGAN. The first flesh-and-blood mammoth found by a man of science was the one discovered on the tundra, near the mouth of the Lena, by the Russian naturalist ADAMS in 1805. Others have been found since, but not at all as many as most people imagine. The author has compiled a list of twenty mammoths and four woolly rhinoceros discovered between 1707 and 1912, and a map giving the locations of these finds. « No mammoth in the flesh, and very few bones, has been found within a couple of thousand miles of the railway zone. The finds are made chiefly in the New Siberian isles, and within a hundred miles or so of the Arctic seashore. » There is no doubt that the New Siberian isles were once part of the continent; they contain large quantities of fossil bones and ivory. It is a pity that this book is so badly written, in a journalistic style, without references. Incidentally, I found in it additional information on the legend that elephants have no joints in their legs, legend dealt with by Col. STEPHENSON in a recent number (*Isis*, 11, 298). Sir THOMAS BROWNE repeated it in his *Pseudodoxia epidemica* (1646), and even SHAKESPEARE referred to it in *Troilus and Cressida*.

G. S.

Forel, Auguste. The social world of the ants compared with that of man. Translated by C. K. OGDEN. Vol. 1., XLV + 551 p., 10 pl. Vol. 2., XX + 445 p., 16 pl. London, G. P. PUTNAM's Sons, 1928. ISIS

Reviewed by J. S. HUXLEY, *Nature*, 121, 819-22, 1928.

Gudger, E. W. Live fishes impacted in the pharynx of man. An addendum. *Archives of Pathology and Laboratory Medicine*, 4, 346-55, September, 1927. ISIS

Gudger, E. W. Fishing with the otter. *The American Naturalist*, 61, 193-225, 1927. ISIS

Otter-fishing in China, Malaya, India, Sweden, Poland, Switzerland, France and Germany, England, Scotland, America. In all the countries where the otter is or has been extensively used as a fisherman, « it has been used in two ways — to catch the individual fish and bring it to its master or to drive the fishes into the net. These two uses parallel those for dogs, as shown by the present writer in another paper. » A final chapter explains how the otter is trained.

G. S.

Gudger, E. W. and **Breder, C. M., Jr.** The barracuda (sphyraena) dangerous to man. Reprinted from *The Journal of the American Medical Association*, 90, p. 1938-1943, 5 fig., Chicago, 1928. ISIS

Moodie, Roy L. Studies in paleopathology, XXII. Pyorrhea in a Pleistocene wolf. *Annals of medical history*, 10, 199-201, 2 fig., 1928. ISIS

Regnier, Robert. Matériaux pour l'organisation d'une exposition de zoologie agricole et d'entomologie appliquée. L'exposition zoologique et florale du Jardin des plantes de Rouen (19-23 Juin, 1924). (Avec la collaboration de R. PUSSARD et E. LE GRAVEREND). *Bulletin de la Société des amis des sciences naturelles de Rouen*, 223-60, 1924-25. ISIS

Vosmaer, G. C. J. (1854-1916). Bibliography of sponges, 1551-1913. Edited by G. P. BIDDER, and C. S. VOSMAER-RÖELL. XII + 234 p. Cambridge University Press, 1928. ISIS

« GUALTHERUS CAREL JACOB VOSMAER, eldest son of CAREL VOSMAER (the poet and author of the great monograph on REMBRANDT), was born on August 29th, 1854, in Nieuw-Beijerland, Netherlands. He entered the University of Leiden in 1873 and studied sponges with F. E. SCHULZE in Graz in 1879-1880, and in the latter year took his doctor's degree at Leiden. Of his doctoral dissertation it is not too much to say that no one ever writes of the canal-system of sponges, and rarely does anyone describe the anatomy of a sponge, without alluding consciously or unconsciously to VOSMAER's *Leucandra Aspera*. In 1882 he was appointed a zoologist on the staff of the Zoological Station at Naples, where he laid the foundation for his magnum opus, the monograph for the Fauna und Flora of the Zoological Station, and in 1882 he published the first part of the volume on sponges in BRONN's Klassen und Ordnungen, completed in 1886. In 1900 he was made a member of the Royal Academy of Science in Amsterdam, and Professor of Zoology in the University of Leiden in 1903; and there he died in September, 1916. The present bibliography of literature dealing with sponges he began in 1880 and was revising in 1916. It has been completed and edited by his widow, Madame VOSMAER-RÖELL, and Dr. G. P. BIDDER. »

Zimmer, John Todd. Catalogue of the EDWARD E. AYER ornithological library. 2 vols. X + 706 p., 12 pl. Chicago, Field Museum of Natural History, 1926. ISIS

Reviewed by GEORGE SARTON, *Isis*, 10, 94, 1928.

V. SCIENCES OF THE EARTH

(implying knowledge of both organic and inorganic nature).

31. — GEOGRAPHY AND OCEANOGRAPHY.

Febvre, Lucien. L'école géographique française et son effort de synthèse. *Revue de Synthèse Historique*, 45, 26-41, 1928. ISIS

Heawood, E. The island of San Matteo. *Nature*, 122, 440, 1928. ISIS

Shand, S. J. The island of San Matteo. *Nature*, 122, 440, 1928. ISIS

32. — GEOLOGY, MINERALOGY, PALAEONTOLOGY, MINING.

(For palaeobotany, palaeozoology and palaeoanthropology, see respectively 28. *botany,* 29. *zoology and* 39. *prehistory.)*

Chamberlin, Thomas Chrowder (1843-1928). The growth of the earth. 23 p., 4 fig. Reprint from *Scientia*, Sept. 1927. ISIS

Grunewald und **Eichenberg**. Urkundliche. Beiträge zur Geschichte des rheinischen Braunkohlenbergbaues. *Beiträge zur Geschichte der Technik und Industrie*, 15, 126-147, 16 fig., 1925. ISIS

Hawkes, Arthur J. Jubilee exhibition of early mining literature, Wigan public libraries. May 1 to September 29, 1928. Annotated catalogue compiled and arranged, with an introduction. Foreword by the Earl of CRAWFORD AND BALCARRES. XIV + 38 p. Wigan, Public Library, 1928. ISIS

Illies (Oberingenieur). Aus der geschichtlichen Entwicklung des Eisenhüttenswesens Oberschlesiens anhand der Geschichte der Königshütte. *Beiträge zur Geschichte der Technik und Industrie*, 12, 1-39, 27 fig., 1922. ISIS

Landes, Henry. History of geology in the state of Washington. *The Washington Historical Quarterly*, 19, 243-49, 1928. ISIS

Orth, Friedrich. Die prähistorische Kupfergewinnung und ihre Darstellung im « Deutschen Museum ». *Beiträge zur Geschichte der Technik und Industrie*, 11, 216-28, 18 fig., 1921. ISIS

Pieper, Wilh. Die Entwicklung des Kohlenberghaus im Gebiet um Halle bis zum Bau der Eisenbahnen. *Beiträge zur Geschichte der Technik und Industrie*, 16, 133-52, 1926. ISIS

Sparn, Enrique. La diferenciación de las ciencias geologicas de acuerdo con el título de suas revistas. *Boletín de la Academie Nacional de Ciencias*, Cordoba, 30, 341-347. Buenos Aires, 1927. ISIS

Reviewed by ZAUNICK, *Mitteilungen zur Geschichte der Medizin*, 27, 165, 1928.

Sudbury, Louise. What is the first fossil collected by man? *Science*, 68, 135, 1928. ISIS

The *Cycadeoidea etrusca* in the Capellini Museum, Bologna.

Treptow, E. Bergmännische Kunst. *Beiträge zur Geschichte der Technik und Industrie*, 12, 173-212, 41 fig., 1922. ISIS

(Wegener, Alfred). Theory of continental drift : a symposium on the origin and movement of land masses, both intercontinental and intra-continental, as proposed by ALFRED WEGENER. By W. A. J. M. VAN WATERSCHOOT VAN DER GRACHT, BAILEY WILLIS, ROLLIN T. CHAMBERLIN, JOHN JOLY, G. A. F. MOLENGRAAFF, J. W. GREGORY, ALFRED WEGENER, CHARLES SCHUCHERT, CHESTER R. LONGWELL, FRANK BURSLEY TAYLOR, WILLIAM BOWIE, DAVID WHITE, JOSEPH T. SINGEWALD, Jr., and EDWARD W. BERRY. x + 240 p. Tulsa, Oklahoma, The American Association of Petroleum Geologists, 1928. ISIS

Reviewed by ARTHUR HOLMES, *Nature*, 122, 431-33, 1928.

33. — METEOROLOGY, CLIMATOLOGY, AND TERRESTRIAL PHYSICS.

Shaw, Sir Napier, with the assistance of ELAINE AUSTIN. Manual of Meteorology, Vol. II. Comparative Meteorology. XL + 466 p., 225 ill. Cambridge University Press, 1928. ISIS

Reviewed by ALEXANDER MCADIE, *Science*, vol. 67, 632, 1928, and by V. BJERKNES, *Nature*, 121, 931-32, 1928.

Tallqvist, Knut. Himmelsgegenden und Winde. *Studia Orientalia* edidit Societas Orientalis Fennica. 2, 105-185, Helsingfors, 1928. ISIS

Very elaborate study on the names of celestial directions and winds in a great many languages. Main divisions : Einleitende Betrachtungen; Die lokal-geographische Orientierung : Wasserseite, Seewind Landseite, niederes Land, Hochland. Nach Bergen, Flüssen, Ländern und Ortschaften bennante Richtungen; Die Qibla-Orientierung; Die Solare orientierung; Die polare Orientierung; Die Zwischenrichtungen; Nachträge; Wörterverzeichnis.

VI. ANTHROPOLOGICAL AND HISTORICAL SCIENCES

(Knowledge of man, past and present).

34. — ANATOMY.

Ramón y Cajal, Santiago. Degeneration and regeneration of the nervous system. Translated and edited by RAOUL M. MAY. 2 vols. illust. Oxford University Press, London, MILFORD, 1928. (50 s.) ISIS

An analysis of the original edition of this fundamental work, *Estudios sobre la degeneración y regeneración del sistema nervioso* (Madrid, 1913-14), was published in *Isis*, 7, 280-81. That original edition was distributed mainly to South American subscribers. Itis not too much to say that it was practically unknown in Europe and North America. Moreover the author has taken

advantage of this translation to improve his text and to add to it a number of notes representing the result of eight years of continuous and patient study. MAY's excellent translation of one of the classics of modern anatomy is thus at the same time a new edition of it. It is splendidly published by the Oxford Press and contains a fine portrait of the author. For a sketch of the latter's life and personality, see R. M. MAY in *Isis*, 8, 498-503. It is worthwhile recalling that the first chapter of Degeneration (vol. 1, 3-26) is devoted to the history of the subject from the time of AUGUSTUS VOLNEY WALLER (1850, 1852), down to RAMÓN's own time. The author pays homage to WALLER, whose intuitions were truly prophetic. In spite of the fact that histological technique was utterly insufficient in WALLER's days, he was able to formulate the true solution of the problem « Paradoxical as it may appear, it is certain that in the problem with which we are dealing, contrary to the usual course of science, error is modern while truth is ancient. » G. S.

Singer, Charles. The evolution of anatomy. A short history of anatomical and physiological discovery to HARVEY. Being the substance of the Fitzpatrick Lectures delivered at The Royal College of Physicians of London in the years 1923 and 1924. London, KEGAN PAUL; XII + 209 p., 22 pl., 117 fig. New York, KNOPF, 1925. ISIS

Reviewed by CHAUNCEY D. LEAKE, *Isis*, 10, 521-24, 1928.

35. — PHYSICAL ANTHROPOLOGY.

(*Anthropometry and races of man*)

Andersson, T. och Thordemann, B. VALDEMAR ATTERDAGS Tåg mod Gotland 1361 och Krigergravarna vid Korsbetningen. Två Studior. 49 p. K. Vitterhets-Historie-och Antikvitetsakademiens Förlag. (German summary.) Stockholm, 1927. ISIS

See note on E. CLASON, below. J. W. S. J.

Clason, E. Om i Korsbetningsgraven vid Visby funna skelett. Kgl. Vitterhets Akademiens Handlingar, XXVIII, 1925. ISIS

Before King VALDEMAR ATTERDAG conquered Visby in Gotland, Sweden, his army was engaged in a very bloody battle with the peasants of the island, who had raised themselves against the foreign intruder. All those who fell were buried on the battlefield itself and the spot was marked with a stone cross bearing an inscription and the exact date 7-7-1361. Recent excavations have shown that the corpses were thrown pêle-mêle into the graves, mere holes dug out in the earth, each containing hundreds of dead men, lying in their war-hoods, and we are thus in possession of a series of skeletons, exactly dated which constitute excellent material for an anthropological examination. CLASON's investigations have shown, that the peasant army was made up of quite young and of a great many old men, of which many were invalids, suffering from arthritical diseases, malformations after fractures, etc., which shows that only the youngsters and the old men were left, when the invasion took place. J. W. S. J.

Osborn, Henry Fairfield. Man rises to Parnassus. Critical epochs in the prehistory of man. (Second edition.) XIX + 251 p. Princeton, Princeton University Press, 1928. ISIS

36. — PHYSIOLOGY

(*human and comparative*).

Fulton, J. F. Muscular contraction and the reflex control of movement. XV + 644 p., 204 + 11 fig., Baltimore, WILLIAMS and WILKINS, 1926. ISIS

Elaborate historical introduction, p. 3-55, with chronological bibliography and many illustrations. G. S.

Irsay, Stephen d'. Der philosophische Hintergrund der Nervenphysiologie im 17. u. 18. Jahrhundert. *Archiv für Geschichte der Medizin*, 20, 181-97, 1928. ISIS

37. — PSYCHOLOGY

(*human and comparative*).

Blondel, Charles. Introduction à la psychologie collective. (Collection Armand Colin). 211 p. Paris, COLIN, 1928 (frs. 9). ISIS

Contents : Première partie. La psychologie selon COMTE, DURKHEIM et TARDE; Deuxième partie : 1. La perception; 2. La mémoire; 3. La vie affective. Conclusion. Bibliographie.

40. — ETHNOLOGY.

(*Primitive and popular science*).

Alvarez, Walter C. Dr. NICOLAS LEON (1859-). *Annals of Medical History*, 10, 316-18, 1928. ISIS

Gudger, E. W. Wooden hooks used for catching sharks and *Ruvettus* in the south seas; a study of their variation and distribution. *Anthropological papers of the American Museum of Natural History*, 28, part 3, p. 199-348, 92 fig., New York, 1928. ISIS

« There is one type of *Ruvettus* hook widely distributed in the Pacific, the local variations consisting of inessentials. So *Ruvettus* fishing, as a culture traitcomplex, is common to all of the three main culture areas (insular) in the Pacific. The ethnographical significance of this is that the technique of *Ruvettus* fishing has been distributed over the whole insular area in the Pacific and, since the distribution is continuous, presumably from a single center. Such examples of wide diffusion for a highly specialized trait are far from numerous, which enhances the importance of this contribution. »

CLARK WISSLER.

Harcourt, Raoul et Marg. Béclard d'. La musique des Incas et ses survivances, vol. 1, Texte, 8-576 p.; vol. 2, 23 p., 39 pl. Paris, GEUTHNER, 1925. ISIS

Reviewed by R. C. ARCHIBALD, *Isis*, 10, 524-6, 1928.

Hoffmann-Krayer, E. Volkskundliche Bibliographie für die Jahre 1921 und 1922. Im Auftrage des Verbandes Deutscher Vereine für Volkskunde herausgegeben. XXVII + 414 p. Berlin, WALTER DE GRUYTER, 1927. ISIS

Horwitz, Hugo Th. Beiträge zur aussereuropäischen Technik. *Beiträge zur Geschichte der Technik und Industrie*, 11, 185-196, 16 fig., 1921; 16, 290-98, 1 fig., 1926. ISIS

Horwitz, Hugo Th. Ueber die Konstruktion von Fallen und Selbstschüssen. *Beiträge zur Geschichte der Technik und Industrie*, 14, 85-100, 21 fig., 1924. ISIS

Horwitz, Hugo Th. Der Streit über die Tipiti-Presse. *Beuträge zur Geschichte der Technik und Industrie*, 17, 159-61, 1 fig., 1927. ISIS

Horwitz, Hugo Th. Ueber eine Urform von Lager- und Scharnierkonstruktionen. *Beiträge zur Geschichte der Technik und Industrie*, 17, 162-3, 3 fig., 1927. ISIS

Reichborn-Kjennerud, J. Vår gamle Trolldomsmedisin. I. (*Skrifter utgitt av Det Norske Videnskaps-Akademi* i Oslo, II. *Hist.-Filos. Klasse*. 1927. No. 6. 284 p. Oslo, JACOB DYBVAD, 1928.) ISIS

Out of the Sagas the author has compiled every possible note concerning animism, demonology, popular medical treatment, medical superstition and folklore. This enormous material is compared with the medical folklore of our days and with that of the classic authors. Though the old Scandinavian medicine has been treated by a great many other authors, and the literature about it is very considerable this work is the first real handbook on the subject. The notes fill not less than 46 pages printed in two columns. A bibliography (12 pages) and a very large index of special terms are added to this excellent work. May the two following parts soon appear. J. W. S. J.

Smith, G. Elliot; Malinowski, Bronislaw; Spinden, Herbert J.; Goldenweiser, A. Culture : the diffusion controversy. (*Psyche miniatures, general series*, no. 18.) 98 p. London, KEGAN PAUL, 1928. ISIS

Tassmann, Günter. Ein Beitrag zur eisenhüttentechnischen Entwicklung der Naturvölker Kameruns. Eisenhütten- und Schmiede-

wesen der Baja. *Beiträge zur Geschiche der Technik und Industrie*, 11, 95-116, 22 fig., 1921. ISIS

Wright, Jonathan (1860-1928). Medicine of primitive man. *Medical life*, vol. 34, 514-18, 1927; vol. 35, 366-72, 1928. ISIS

41. — SUPERSTITION AND OCCULTISM.

Bächtold-Stäubli, Hanns. Handwörterbuch des deutschen Aberglaubens. Herausgegeben unter besonderer Mitarbeit von E. HOFFMANN-KRAYER und Mitwirkung zahlreicher Fachgenossen. Bd. I. Lieferung 1. Berlin, WALTER DE GRUYTER, 1927. ISIS

Dacqué, Edgar. Natur und Seele. Ein Beitrag zur magischen Weltlehre. 200 S., 1 Bl. Inhalt. München, R. OLDENBOURG, 1926. ISIS

Reviewed by Graf CARL v. KLINCKOWSTROEM, *Isis*, 10, 95-8, 1928.

Edgell, William. Does the earth rotate? Reprint. 69 p. Radstock, Somerset, The author, Westfield House, 1927. ISIS

Reviewed by A. C. D. C., *Nature*, 121, 981, 1928.

Jollivet, Castelot. Chimie et alchimie. 288 p. Paris, E. NOURRY, 1928.

Jollivet, Castelot. La fabrication chimique de l'or. Texte français (traductions anglaise, allemande, espagnole). 126 p. JOLLIVET CASTELOT Douai, 19 Rue Saint-Jean, 1928. ISIS

Reviewed by A. A. E., *Nature*, 121, 981, 1928.

Krause, Arthur. Die Astrologie. Entwicklung, Aufbau und Kritik. VII + 319 p., 50 fig. Leipzig, J. J. WEBER, 1927. ISIS

Reviewed by W. GUNDEL, *Deutsche Literaturzeitung*, 783-4, 1928.

Maxwell, Joseph. La divination. 84 p. Paris, *Biblioth. de philos. scientif.*, E. FLAMMARION, 1927. ISIS

J'ai précédemment signalé (*Isis*, 6, 121), un livre consacré par l'auteur à la magie. L'ouvrage qu'il vient de publier dans la même collection fait directement suite au précédent. Il y étudie sommairement tous les procédés divinatoires dans leur évolution historique (106 p.), les procédés usuels dans la société contemporaine (95 p.), leur mécanisme psychologique qui dépend de l'intuition considérée comme une faculté de la conscience organique (subconscient) qui trouve sa base dans la sensibilité, et qui correspond à un être continu (réincarnation). L. G.

43. — SOCIOLOGY, JURISPRUDENCE AND POSITIVE POLITY.

Bouvier, Robert. La notion de loi. Esquisse historique et remarques générales. *Revue de Synthèse Historique*, 45, 5-26, 1928. ISIS

Fisher, H. A. L. PAUL VINOGRADOFF, a memoir. Oxford, Clarendon Press, 1927. ISIS

Reviewed by N. NEILSON, *Speculum*, 3, 107-9, 1928.

Guénon, René. La crise du monde moderne. 248 p., BOSSARD, Paris, 1927. ISIS

On va partout parlant du malaise de la société du XXe S., de crise latente, de révolution qui couve. Pour GUÉNON, notre monde occidental est entré en crise, en décadence, au début du XIVe siècle; l'humanisme de la Renaissance a précipité la chute qui ne fait que s'accentuer, et que rien ne pourrait plus arrêter, sinon un retour à la « tradition », à la « contemplation », mis en œuvre par une élite qui pourrait s'appuyer sur l'église catholique à condition que celle-ci se dépouillat de tout ce qui n'est pas conforme à la tradition profonde de la doctrine hindoue, telle du moins que l'entend l'auteur (Voir pour 2 autres ouvrages de GUÉNON, de même inspiration, *Isis*, 8, 591, 642). L. G.

Pipkin, Charles W. The idea of social justice : a study of legislation and administration and of the labour movement in England and France between 1900 and 1926. XVI + 595 p. New York, MACMILLAN, 1927. ISIS

Reviewed by AMY HEWES, *American Historical Review*, 34, 130-32, 1928.

44. — HISTORY OF CIVILIZATION

(*General History, Historical methods, Biography and Chronology.*)

Revue Historique. Histoire et historiens depuis cinquante ans. (*Bibliothèque de la Revue Historique.*) Two volumes. p. XII,1-472, 473-758, Paris, ALCAN, 1927. ISIS

Collection of essays to celebrate the golden jubilee of the *Revue historique*.
Reviewed by J. F. JAMESON, *American Historical Review*, 34, 92-3, 1928.

45. — HISTORY OF ART.

(*Art and science, Iconography. Arts and crafts*).

Blum, André. Les sources iconographiques et leur enseignement; leur valeur artistique et historique. *Bulletin of the international committee of historical sciences*, 1, 736-46, 1928. ISIS

Depréaux, Albert. L'iconographie, science auxiliaire de l'histoire. *Bulletin of the international committee of historical sciences*, 1, 725-35, 1928. ISIS

Guastalla, Pierre. L'esthétique et l'art. 205 p. VRIN, Paris, 1928. ISIS

Cet ouvrage nous apporte des discussions intéressantes et originales sur un certain nombre de questions généralement mal posées, ou posées d'une manière trop vague : notamment sur l'introduction de la notion de valeur en esthétique, sur les caractères comparés de l'artiste et de l'amateur d'art, sur le rôle de l'habitude et du rêve dans l'élaboration de l'inspiration artistique, sur l'esthétique spéciale à chaque art. M. GUASTALLA qui est à la fois un savant et un artiste (*Isis*, 9, 207) n'apporte sans doute pas la solution définitive à ces problèmes qui sont en marge des domaines de la science et de l'art; mais il aidera son lecteur à voir plus clair en sa propre pensée, ce qui est déjà un grand mérite. H. M.

Klein, Walter. Geschichte der Gmünder Edelmetallindustrie. *Beiträge zur Geschichte der Technik und Industrie*, 17, 72-79, 14 fig., 1927.

48. — HISTORY OF PHILOSOPHY.

(*See also above* 18. *Philosophy of Science*).

Brunschvicg, Léon. Le progrès de la conscience dans la philosophie occidentale. Deux vols. (*Bibliothèque de philosophie contemporaine*), XXIII + 807 p. Paris, ALCAN, 1927. ISIS

Reviewed by HÉLÈNE METZGER, *Isis*, 10, 98-102, 1928.

49. — HISTORY OF RELIGION.

(*Science and Religion*).

Archambault, Paul, et autres. La renaissance religieuse. Introduction et conclusion par GEORGES GUY-GRAND. 273 p. (*Bibl. de philos. contemp.*) Paris, ALCAN, 1928. ISIS

Enquête menée en France seulement (ce que devrait indiquer le titre de l'ouvrage), par GEORGES GUY-GRAND et à laquelle ont apporté leur témoignage, des représentants du catholicisme : R. P. YVES DE LA BRIÈRE, GAETAN BERNOVILLE, PAUL ARCHAMBAULT, R. P. JOSEPH DE TONQUÉDEC, JACQUES CHEVALIER; du protestantisme : A. N. BERTRAND, RENÉ GILLOUIN; du judaïsme : JULIEN WEILL, ANDRÉ SPIRE; du rationalisme laïque : RAMON FERNANDEZ, PAUL LOUIS COUCHOUD, FÉLIX SARTIAUX, FÉLICIEN CHALLAYE, PAUL MASSON-OURSEL, LÉON BRUNSCHVICG; ces trois derniers étudiant les rapports de l'Orient et de l'Occident. L. G.

Delehaye, H. Les légendes hagiographiques. Troisième édition, revue et complétée. XV + 226 p. Bruxelles, Société des Bollandistes, 1927. ISIS

Reviewed by PAUL MONCEAUX, *Journal des Savants*, 368-69, 1928.

Delehaye, H. Sanctus. Essai sur le culte des saints dans l'antiquité. VIII + 266 p. Bruxelles, Société des Bollandistes, 1927. ISIS

Reviewed by PAUL MONCEAUX, *Journal des Savants* 368-69, 1928.

Lodge, Sir Oliver. Why I believe in personal immortality. VIII + 152 p., 4 pl. London, CASSELL, 1928. ISIS

Reviewed in *Nature*, 121, 278-279, 1928.

Singer, Charles. Religion and science. Considered in their historical relations. (*Benn's Sixpenny Library*, no. 144). 79 p. London, ERNEST BENN, 1928. ISIS

A very good account, well thought out and well written, of this old, eternal, problem. If all the volumes of Benn's Sixpenny Library, edited by WILLIAM ROSE, are as good as this one, this new library is a real blessing. G. S.

Söderblom, Nathan. Das Werden des Gottesglaubens. Untersuchung über die Anfänge der Religion. Deutsch hrsg. von R. STÜBE. 2. neubearb. Auflage. XV + 361 p. Leipzig, J. C. HINRICHS, 1926.

Reviewed by FRIEDRICH HEILER, *Deutsche Literaturzeitung*, 1049-1052, 1928.

VII. MEDICINE.

50. — HISTORY, ORGANIZATION, AND PHILOSOPHY OF MEDICINE.

Andrews, Edmund. Medical terminology. *Annals of medical history*, 10, 180-198, 1928. ISIS

Discussing the origin of many medical terms.

Brunn, Walter von. Kurze Geschichte der Chirurgie. IV + 339 p. Berlin, JUL. SPRINGER, 1928. ISIS

Reviewed by ERNST HIRSCHFELD, *Deutsche Litaraturzeitung*, 1128-1130, 1928.

Delaunay, Paul. L'évolution philosophique et médicale du biomécanisme : De DESCARTES à BOERHAAVE, de LEIBNIZ à CABANIS. *Le Progrès Medical*, 20, tiré à part, 55 p., 1927. ISIS

Delaunay, Paul. L'évolution médicale du XVI^e^ au XX^e^ Siècle, *Bulletin de la Société française d'histoire de la médecine*, 22, 17-56. 1928. ISIS

Györy, Tiberius von. Der Anteil Ungarns an der Entwicklung der Medizin. S. A. a.d. Pester Lloyd vom 27. 5. 1928. 29 S. Budapest, 1928. ISIS

Reviewed by HABERLING, *Mitteilungen zur Geschichte der Medizin und der Naturwissenschaften*, 27, 329, 1928.

Haberling, Wilhelm. Woran erkennt man auf Bildnissen den Arzt? *Therapeutische Berichte*, 1928, nos. 2 to 10. ISIS

Rich collection of illustrations with commentary. Physicians are represented

as disciples of Asclepios; with cupping glass and urinal; with patient; with human skull; with herbs; with chemical apparatus; with physical apparatus; with their own books; etc. Thus a collection of portraits tells us the whole history of medicine. G. S.

Kelly, Howard A. and **Burrage, Walter L.** Dictionary of American medical biography. Lives of eminent physicians of the United States and Canada, from the earliest times. Boston, APPLETON, 1928. ISIS

Lenghel, Alexandre. Anciens pessaires trouvés en Hongrie et en Transylvanie. *Bulletin de la société française d'histoire de la médecine*, 22, 185-88, 1928. ISIS

Long, Esmond R. A history of pathology. XXIV + 291 p., 49 pl. Baltimore, WILLIAMS and WILKINS, 1928. (Five dollars) ISIS

As far as I know this is the earliest history of pathology to appear in book form, though a part of the field was covered by KNUD FABER in his *Nosography in modern internal medicine* (in Danish, Copenhagen 1919; English translation, New York, 1923; *Isis*, 6, 98-99). FABER began his account with SYDENHAM. EDGARD GOLDSCHMID's *Entwicklung und Bibliographie der pathologisch-anatomischen Abbildung* (Leipzig, 1925; *Isis*, 8, 817) is something different again, — an historical iconography of pathology. LONG has written his book for medical students, who are primarily interested in the history of medicine *stricto sensu*, and, I am sure, they will find his account very stimulating. It is richly illustrated; 49 plates and other figures, reproducing portraits and pathological illustrations taken from the classics. (But what is the good of reproducing imaginary portraits of CELSUS and GALEN?)

The subject is divided as follows: 1. Pathology of antiquity; 2. GALEN and the Middle Ages; 3. Pathology of the Renaissance; 4. Seventeenth century; 5. MORGAGNI and the eighteenth century; 6. The Paris School at the opening of the nineteenth century; 7. Pathology in England in the first half of the nineteenth century; 8. ROKITANSKY and the new Vienna School; 9. VIRCHOW and the cellular pathology; 10. Pathological histology and the last third of the nineteenth century; 11. Rise of bacteriology and immunology; 12. Experimental and chemical pathology.

To illustrate how much such a history differs from the general history of medicine, it will suffice to consider the outstanding names (apart from the greater masters): BENIVIENI, FERNEL, PLATTER, COITER, DODOENS, SCHENCK VON GRAFENBURG, SEVERINO, TULP, PIETER PAUW, WEPFER, BONET, KERKRING, BLANKAART, VIEUSSENS, SENAC, SANDIFORT, GAUB, BAILLIE, BAYLE, LOBSTEIN, CRUVEILHIER, RAYER, CARSWELL, HORNER, VETTER, WEICHSELBAUM, PALTAUF, CHIARI, PANUM, RECKLINGHAUSEN, VILLEMIN, STRICKER, WEIGERT, ZIEGLER, ZENKER, PAGET, DELAFIELD, PRUDDEN. G. S.

Meige, Henri. Les urologues dans l'art. *Aesculape*, 54-67, 14 illustr., mars 1928.

Näsström, Gustaf. Det gamle Medevi. 286 p., 76 fig. Stockholm, NILS BRUZELIUS, 1928.

Medevi, the Karlsbad of Sweden, is followed from its origin as a holy spring unto our days. The book, privately printed by the apothecary NILS BRUZELIUS, gives a very good description of the evolution of the thermal place from its foundation as a sanitary institution by URBAN HJÄRNE in 1675. Splendid illustrations. J. W. S. J.

Singer, Charles. A short history of medicine : Introducing medical principles to students and non-medical readers. XXIV + 368 p. Oxford, Clarendon Press, 1928. ISIS

Szumowski, W. La médecine polonaise à travers les siècles. *Paris Médical*, 12e année, I-VI, 13 mai 1922. ISIS

Temkin, Owsei. Die Krankheitsauffassung von HIPPOKRATES und SYDENHAM in ihren :« Epidemien ». *Archiv für Geschichte der Medizin*, 20, 327-52, 1928. ISIS

Wright, Jonathan (1860-1928). Bibliography of his writings, with biography and portrait. *Medical life*, 35, 358-366, 1928. ISIS

51. — EPIDEMIOLOGY, HISTORY OF SPECIAL DISEASES. PUBLIC HEALTH AND SOCIAL MEDICINE.

Hansen, Aksel. Om Chlorosens, den aegte Blegsots, Optraeden i Europa gennem Tiderne. XXVIII + 202 p., XVIII, 29 fig. Schäffer, KOLDING, 1928. ISIS

A very elaborate study on the genuine chlorosis and its relation to the use of corsets and stays. Unknown in antiquity, the disease follows the modes, appears when corsets are in use and disappears when they are out of fashion. The disease is restricted to the female sex. Discussion of the different theories about its origin. J. W. S. J.

Meyerhof, Max. Nachträge zur Geschichte des Begriffes Pannus. *Archiv für Geschichte der Medizin*, 20, 390-96, 1928. ISIS

52. — HISTORY OF HOSPITALS AND OF MEDICAL TEACHING.

Andel, M. A. van. Vroedvrouwenbordjes. *Bijdragen tot de geschiedenis der geneeskunde*, 8, 149-153, 3 fig., 1928. ISIS

Giedroyc, F. Le service de santé dans l'ancienne Armée polonaise. (Sluzba zdrowiaw dawnem Wojsku polskiem). Varsovie, 1927. ISIS

Reviewed by V. BUGIEL, *Bulletin de la Société française d'histoire de la médecine*, 22, 84-5, 1928.

ellinga, G. De voormalige Amsterdamsche clinische school en het

Binnengasthuis, 1828 — 1 September — 1867. *Bijdragen tot de geschiedenis der geneeskunde*, 8, 230-79, 1928. ISIS

Schevensteen, A. van. Les chirurgiens de l'hôpital Sainte-Elisabeth à Anvers, jusqu'à la fin de l'Ancien Régime. *Recueil des mémoires couronnés et autres mémoires de l'Académie royale de médecine de Belgique*, 23, 46 p., Bruxelles, Imprimerie l'Avenir, 1927.

Sieur (Médecin inspecteur général). Histoire des tribulations du corps de santé militaire depuis sa création jusqu'à nos jours. *Bulletin de la Société française d'histoire de la médecine*, 22, 92-163, 1928. ISIS

53. — PHARMACY. PHARMACOLOGY. TOXICOLOGY.

Andel, M. A. van. Klassieke Wondermiddelen. XI. Bezoarsteenen; XII. Terra sigillata. *Bijdragen tot de geschiedenis der geneeskunde*, 8, 197-215, 1928. ISIS

Cripps, Ernest C. Plough Court, the story of a notable pharmacy, 1715-1927. XVIII + 227 p., 43 illus. London, ALLEN and HANBURYS, 1927. ISIS

Students of the history of pharmacy, particularly those who have been interested in the apothecary shop as a factor in human civilization, will welcome this volume. Not only is it well written, but as a specimen of the art of book making it will hold its own in the best of libraries. « Greift nur hinein ins volle Menschenleben, und wo ihr's packt da ist es interessant ». These words of GOETHE apply particularly to the apothecary shop that has touched mankind at so many points. It is particularly true of the old Plough Court apothecary shop and the institutions of modern pharmacy to which it has given birth.

While all of the excellent portraits are welcome to the collector of pharmaceutical biography, the fine features of DANIEL HANBURY as represented on the medal known by his name make a special appeal. The facsimile of a letter in his fine penmanship seems to reveal the Quaker of high standards as a man as well as the historian of drugs. Though he died when only fifty, yet he lived to finish, with FLUECKIGER, the « Pharmacographia ».

E. K.

Gesellschaft für Geschichte der Pharmazie. *Isis*, 10, 56-57, 1928. ISIS

Gildemeister, Eduard, und **Hoffmann, Friedrich.** Die aetherischen Oele. Dritte Auflage. Erster Band. XVI + 864 p., 2 maps, illus. Leipzig, L. STAACKMANN, 1928 (M. 32.00.) ISIS

Volume one of the third edition published under the auspices of SCHIMMEL & Co., in Miltitz near Leipzig, has just made its appearance. To students

of the history of science this volume is of special interest because of the first three chapters, viz.

Der Gewuerz und Spezereihandel im Altertum und im Mittelalter. With two maps : one showing the trade routes during antiquity, the other showing their expansion during the middle ages (pp. 1 to 14).

Allgemeine Geschichte der aetherischen Oele (pp. 15 to 220) with three illustrations.

Geschichte der Destillirweisen und der Destillirgeraete (pp. 221 to 262 with forty-nine illustrations). E. K.

(Merck, E.) E. MERCK Chemische Fabrik Darmstadt. Large quarto, 127 p., illus. 1928. ISIS

Some years ago there appeared, in a German periodical, an account of the personal relation of GOETHE to scientists. Most of these were pharmacists who had made a reputation in chemistry. It has been assumed that, because of this relationship, it was possible for the author of « Hermann und Dorothea » to delineate the apothecary as we find him in this epic. Somewhere the personal intercourse between GOETHE and « Geheimrath » MERCK has been described. This « Geheimrath » MERCK was no other than a close relative of the apothecary MERCK of Darmstadt.

The history of the « Engelsapotheke » in Darmstadt is an interesting one. Its contributions to pharmacy and medicine are too well known to call for special comment. The exchange of the factory property within the city for a large area of municipal property outside of the city limits and the erection of a model factory out in the country, as it were, constitute an experiment in sociology and economics that possibly deserves more attention on the part of the representatives of these fields of human knowledge. The general historian also may well afford to give more attention to this and similar manifestations of modern history at a time when problems of city growth and factory development are effecting our national wellbeing.

This volume, welcome as it has been to the student of the history of pharmacy, should be equally welcome to the historian, economist and the sociologist. Its make-up is exceedingly attractive and worthy of the publishing firm.

E. KREMERS.

VIII. EDUCATION.

(the methods of accumulating, imparting and diffusing knowledge).

55. — ACADEMIES, SOCIETIES, CONGRESSES. NATIONAL AND INTERNATIONAL ORGANIZATION OF SCIENCE.

(*Societies and congresses devoted to particular sciences are classified under those sciences. For the internal organization of science* — ISIS, I, 195 — *see section* 17).

Dehérain, Henri. L'institut de France et ses publications. *R. internat. de l'enseignement*, 48e année, 14-35, 1928. ISIS

Röpke, W. Die Veröffentlichungen der Kaiserlich Leopoldinisch Deutschen Akademie der Naturforscher. *Leopoldina*, 3, 149-158, 1928. ISIS

56. — BIBLIOGRAPHY.

(*Methods, Libraries*).

Barwick, G. F. The Aslib directory. A guide to sources of specialized information in Great Britain and Ireland. Introductions by Sir FREDERIC G. KENYON and Sir ERNEST RUTHERFORD. XIII + 425 p. Published with the financial assistance of the Carnegie United Kingdom jointly by the Association of Special Libraries and Information Bureaux and the Oxford University Press, London, 1928. (L. 1.1.0). ISIS

« This directory is divided into three sections : (a) Collections of material and information arranged under subjects. (b) Alphabetical list of towns and places where the material in (a) is to be found. (c) Index to collectors and named collections. » Thus in section 1, by far the largest (304 p.) one finds such headings as Bolshevism, FARADAY, Hebrew language, Obstetrics, etc. and under each a list of special libraries and collections. To the scholar the most useful part perhaps will be the third which will enable him to find where well known libraries or collections are now located. E.g., where is the MORRISON Chinese library? At the School of Oriental Studies, London. Where, the GERTRUDE BELL oriental collection? At Armstrong College, Newcastle-on-Tyne. Where, the FERGUSON chemical library? At Glasgow University. Where, the WHEATSTONE electrical library? At King's College, London. Where, the TAYLOR-SCHECHTER collection of Mss. from the Cairo Genizah? At the Cambridge University library. Where, Dr. BIESENTHAL's rabbinical library? At the United Free Church College of Aberdeen. Where, the AUGUSTUS DE MORGAN mathematical library? At London University, etc. I have two criticisms to make. First, there are far too many meaningless statements, such as « special library » or « departmental library ». Second, with regard to collections gathered by individuals, their death year should always be quoted, or the date of the collection. As it is, this directory will already render great services. It illustrates admirably the immense wealth of materials available to scholars in Great Britain and Ireland. G. S.

(Cracow. Jagellonian Library). Bibljoteka Jagiellonska. Katalog wystawy rekopisów i druków przyrodniczo-lekarskich. XIII-XVI Wieku, 28 p. Cracow, GEBETHNER and WOLFF, 1928. ISIS

Fine catalogue with 9 plates.

57. MUSEOLOGY

(*Museums and Collections*).

Regnier, Robert. L'Exposition du centenaire (1828-1928). Le Muséum

d'histoire naturelle, d'ethnographie et de préhistoire de Rouen. 1928. ISIS

Contains valuable information on the Rouen museum, on FELIX-ARCHIMÈDE POUCHET (1800-72), GEORGES PENNETIER (1836-1923), GEORGES POUCHET (1833-94), EUGÈNE MESNARD. G. S.

Regnier, Robert. Le biologiste et le conservateur de musée. Discours de réception à l'Académie de Rouen. 16 p. Rouen, Imprimerie CAGNIARD, 1927. ISIS

59. — ERRATA AND ADDENDA, no 17.

(*For previous errata, see* Isis, 11, 567)

Vol. 5, 502. line 6. AL-GHUZÛLÎ died in 1412-13 (not 1212), according to HÂJÎ KHALÎFA (no. 12237, vol. 5, 598).

Vol. 7, 594, note 4. EDDINGTON, ARTHUR STANLEY; not Edington.

Vol. 8, 559. note TOUZET, passim. Read Mme. de WARENS (not Warrens).

608, 773. Russian mathematician, VASIL'EV, ALEKSANDR VASIL'EVICH.

744, note ASTEGIANO. See LYNN THORNDIKE in *Isis*, 10, 362.

Vol. 10, 227. note 4. SALZMAN, LOUIS FRANCIS; not Salzmann.

290, last note. BURKITT, MILES CRAWFORD; not Burkit.

493, footnote 8. read WORT, not word.

Vol. 11, 151. The Twenty Third Bibliography contained 1345 items (not 790).

Vol. 12, 114. footnote, last line, read Quant à KRONER voir la bibliographie à la note 32 (not 29).

Sarton's Introduction.

Vol. 1 [1], 782. Note on NATHAN BEN JETHIEL. His dictionary was called 'Arûk, not Aruk.

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(1) From HOMER to OMAR KHAYYAM. XII + 840 p. (Baltimore, WILLIAMS and WILKINS; London, BAILLIERE TINDALL and COX, 1927).

A few other misprints are not mentioned in these errata because they are too obvious to cause any error or confusion. I wish to express my thankfulness to the readers who take the trouble to make the above-mentioned corrections is their copies of Isis and the Introduction. I would advise them after having accomplished that little task, to write their initials near mine at the bottom of this note, thus to indicate that these and the previous errata have been taken into account. G. S.

These and previous errata have been corrected by . . . . . .

The corrections have been made in the card index by . . . . . .

Author's Index to the Twenty Fifth Bibliography.

The Roman figures refer to centuries; the Arabic figures, to the sections of parts II and III, which are numbered consecutively from 1 to 59. This index will enable one to find more easily the papers analyzed in the present bibliography, and also to see at a glance what each writer is doing.

November 28, 1928. FRANCES SIEGEL.

A

Abbott, F. F., 5.
Addison, W. H. F., XIX (1) C.
Alexander, C. M., 14.
Allote de la Fuye, M., XIX (2) E.
Almagià, R., 2.
Alvarez, W. C., 40.
Andel, M. A. van, 52, 53.
Andersson, T., 35.
Andler, C., XIX (2) E.
Andrews, E., 50.
Antz, E. L., XV (2).
Archambault, P., 49.
Archiv f. Gesch. d. Math., d. Naturwis. u. d. Tech., 16.
Arendt, T., XIX (1) B.
Artom, E., XVII (1) A.
Asín, M., XIV (1).

B

Bachelard, G., 24.
Bächtold-Stäubli, H., 41.
Bacon, Roger, XIII (2).
Baer, E. K. von, XIX (1) C.
Baglioni, S., 12.
Bailey, E. W., 18.
Banting, W., XIX (2) D.
Barnes, H. E., 16.
Barrère, C., XIX (2) E.
Barthold, W., 8.
Barwick, G. F., 56.
Bashford, H., XIX (1) C.
Bast, T. H., XIX (1) D.
Bateson, B., XX C.
Beckmann, H., XIX (1) B.
Beeson, B. B., XIX (2) D.
Bell, L., 23.
Berdrow, W., XIX (1) B.
Berndt, G., 26.
Bernhard, M., II (2).
Bethge, K., 26.
Betti, M., XIX (2) B.
Beyer, O., 5.
Bianchi, L., XIX (2) A.
Bidez, J., XI (2).
Binoux, Prix, 16.
Birk, A., XVIII (1) B, XIX (1) B.
Blaser, J., XVIII (2) C.

Bligh, N. M., XX B.
Bloch, L., XVII (2) B.
Blondel, C., 37.
Blondheim, D. S., XIII (2), 12.
Blum, A., 45.
Boccardi, J., XIX (2) B.
Bolza, A., XIX (1) B.
Bone, W. A., XIX (1) B.
Bonnerot, J., 6.
Borisiak, A., XIX (2) C.
Bousquet, G. H., XX E.
Boutaric, A., XIX (2) B.
Bouvier, R., 43.
Boyce, H., XVI (1) C.
Brauner, L., 20.
Brauer, J., 17.
Breder, C. M. Jr., 29.
Bréhier, E., III (2).
Brie, F., XIX (2) C.
Broadhurst, J., XVII (2) E.
Brögger, A. W., IX (1).
Broglie, L. de, XIX (1) B.
Browne, Sir T., XVII (1) E.
Brownlie, D., XIX (1) B.
Brun, R., XIV (1).
Brunn, W. von, 50.
Brunet, P., XVIII (2) C.
Brunschvicg, L., 48.
Buchanan, J. A., XIX (1) D.
Buckley, H., 24.
Bureau international des poids et mesures, XIX (2) B.
Burlond, A., XX E.
Burrage, W. L., 50.
Bushnell, D. I. Jr., XVI (2) C.
Buxbaum, B., XIX (1) B, 26.

C

Cajori, F., XVI (1) A, XVII (2) A, XIX (1) A, 20.
Calhoun, G. M., 4.
Camoens, L. de, XVI (2) E.
Canaan, T., 14.
Capparoni, P., XI (1).
Carcopino, J., 5.
Carlyle, A. J., XIII (1).
Carlyle, Sir R. W., XIII (1).
Carus, C. G., XIX (1) E.
Carvalho, A. da S., XIX (1) D.
Caspar, M., XVII (1) A.
Castaldi, L., XVIII (2) D.
Cattell, J. M., XIX (2) C.
Cavaignac, E., 5.
Chaîne, M., 2.
Chamberlin T. C., 32.
Chronique d'Egypte, 2.
Cittert, M., 16.
Clark, H. O., 26.
Clason, E., 35.
Cohen, Hk., XVII (1) D.
Contenau, G., 8.
Cormack, W. E., XIX (1) C.
Coronedi, G., XIX (2) D.
Cournot, A., XIX (1) E.
Coutinho, G., XVIII (2) C.
Cracow, Jagellonian Library, 56.
Cripps, E. C., 53.
Crompton, R. E. B., XIX (2) B.
Crummer, Le R., XVIII (2) D.
Cunningham, J. T., 27.

D

Dacqué, E., 41.
Däbritz, W., 26.
Dalman, G., 12.
Daniloff, S., 26.
Darwin, C., XIX (2) C.
Daudin, H., 27.
David-Neel, A., 8.
Davies, N. de G., 2.
Davis, T. L., XIII (2), XVIII (1) B, 25.

Dawson, P. M., XVI (1) D.
Dehérain, H., 55.
Delamere, C., 4.
Delaunay, P., 50.
Delehaye, H., 49.
Depréaux, A., 45.
Descartes, R., XVII (1) A.
Desch, C. H., 3.
Dickmann, H., XIX (1) B, XIX (2) B.
Diepgen, P., XIX (2) D.
Dietz, R., XIX (2) B.
Digby, B., 29.
Disney, A. N., 24.
Döhner, O. H., 26.
Doesborch, J. van, XVI (1) C.
Donnan, F. G., 27.
Dostoievsky, A. A., XIX (2) C.
Dreger, M., XIX (2) B.
Duhem, P., XIX (2) B.
Du Pasquier, L. G., XVIII (1) A.

E

Ebstein, E., XVIII (2) D.
Edgell, W., 41.
Edwards, C. W., 24.
Efros, I., XII (1).
Ehrenberg, R., XVI (1) E.
Eichenberg, 32.
Enderes, B., XIX (1) B.
Engineering History, 26.
Englert, L., 1.
Ericsson, J., XIX (1) B.
Eusebios, Bishop of Caesarea, IV (1).
Evans, Sir A. J., 1.
Ewing, Sir J. A., 24.

F

Fabry, C., XIX (1) B.
Färber, E., 25.
Fais, A., XIX (2) A.
Falk, Hj., IX (1).
Farmer, H. G., IX (2).
Fauconnet, A., XIX (1) E.
Faure, J. L., XIX (2) D.
Febvre, L., 31.
Feld, J., 22.
Feldhaus, F. M., XVII (1) A, 20.
Ferrero della Marmora, conte Alberto, XIX (1) C.
Feyfer, F. M. G. de, XVII (1) D.
Finger, C. J., XIX (2) C.
Fisher, H. A. L., XIX (2) E, 43.
Forel, A., 29.
Forgue, E., XVII (1) E.
Fox, H. M., 27.
Fosi, V., XVII (2) C.
Franz, U., 27.
Fresnel, A., XIX (1) B.
Freytag, L., XIX (2) B.
Fuchs, F., XIX (2) B.
Fulton, J. F., 36.

G

Gale, H. G., 24.
Gânguli, S. K., V (2), XII (1).
Garçon, M., XIX (2) E.
Gardenghi, G., XVIII (1) B.
Gardiner, A. H., 2.
Garrison, F. H., XIX (2) D.
Gautier, E. F., 14.
Gavrilov, M., 8.
Geddes, A., 9.
Geffcken, J., 4.
Geisler, K. W., 25.
Gentile, F., XVII (1) E.
Gertz, O., XVIII (1) C.
Gesellschaft f. Gesch. d. Pharmazie, 53.
Geyer, D. W., XIX (2) B.

al-Ghazzâlî, XI (2).
Gidon, F., XVIII (2) C.
Giedroyc, F., 52.
Gieseke, D., XIX (2) B.
Gildemeister, E., 53.
Ginsburg, J., XVI (2) A.
Glossaria Latina jussu Acad. Britannicae edita, 6.
Goethe, J. W. v., XVIII (2) B.
Goichon, A. M., 14.
Goldenweiser, A., 40.
Gomperz, H., 4.
Goodman, H., XIX (2) D.
Goulard, R., XVII (1) D, XVII (2) D.
Graux, L., XIII (2).
Grierson, Sir G. A., 9.
Griffith, F. L., 2.
Grunewald, 32.
Guastalla, P., 45.
Gudger, E. W., 29, 40.
Guénon, R., 43.
Guérinot, A., 9.
Guillaume, C. E., XIX (2) B.
Györy, T. von, 50.

H

Haberling, W., 50.
Hackmann, H., 10.
Haeckel, W., XIX (2) C.
Häneke, H., 26.
Hall, J. W., XIX (1) B.
Hall, H. R., 3.
Halliday, W. R., 1.
Hamel, G., 20.
Hancock, H., 20.
Hansen, A., 51.
Harcourt, Marg. d', 40.
Harcourt, R., XVII (1) C, 40.
Harrison, B., XIX (2) C.
Harvey, W., XVII (1) D.
Hasebroek, J., 4.
Haskins, C. H., XII (1), XIII (1).
Hasse, H., 4.
Hassler, F., XVI (1) E, 26.
Hauberg, P., 6.
Hausbrand, E., XIX (1) B.
Hausen, J., 26.
Hawkes, A. J., 32.
Heath, Sir T. L. III (1) B. C.
Heawood, E., 31.
Hedin, S., XIX (2) C.
Hellinga, G., 52.
Hellmund, H., 18.
Heman, C. F., 12.
Hendrichs, F., 26.
Hennig, R., XVIII (1) B.
Herborn, N., XVI (1) E.
Hermannson, H., XVIII (2) C.
Herrmann, A., 4.
Hirschfeld, E., 6.
History of Science Society, 16.
Höpke, W., 55.
Hoffman-Krayer, E., 40.
Hoffmann, F., 53.
Hofmann, J. V., XIX (2) B.
Hollander, B., XIX (1) D.
Hollingsworth, M. W., XVII (2) D.
Holmyard, E. J., 25.
Honcamp, F., XIX (1) B.
Hoppe, E., 24.
Horwitz, H. T., XV (2), 6, 26, 28, 40.
Hough, W., 26.
Huber, E., 8.
Hulme, E. W., 26.
Humbert, P., XX B.
Hurry, J. B., 2.
Hu, Suh, 10.
Hus, J., XV (1).

I

Ibn Fadl Allâh al-'Umarî, XIV (1).
Ibn Saad, IX (1).
Illies, 32.
Irsay, S. d', 36.

J

Jacob, C., XIX (2) C.
al-Jâhiz, IX (2).
Janet, C., 25.
Japan, science, 11.
Jeans, J. H., 23.
Jenkins, P. G., XVIII (2) C.
Jenkins, R., 26.
Jewitt, J. R., XIX (1) C.
Jochelson, W., 8.
Johannsen, O., XVI (1) B.
Jollivet, C., 41.
Jones, H. W., XIX (1) D.
Jones, P. F., VI (2).
Julliot, C. L., XX D.
Junge, G., 20.
Jungius, J., XVII (1) B.
Junker, H., 2.

K

Kamal, Prince Y., 1.
Kammerer, 26.
Keimer, L., 2.
Kelly, H. A., 50.
Kern, H., XIX (1) E.
Keussen, H., XVII (2) D.
Keynes, G., XVII (1) D.
Kissmeyer, A., XVIII (2) D.
Klein, F., XIX (2) A.
Klein, W., 45.
Klemm, F., XVIII (2) C.
Knowles, J. A., 26.
Köhm, J., 1.
Körte, A., IV (1) B. C.
Kokomoor, F. W., XVII (1) A.
Komppa, G., 25.
Koopman, J., XVIII (2) D.
Krause, A., 41.
Kubitschek, W., 1.

L

Lagier, C., 2.
Landes, H., 32.
Lanselle, M., XVI (2) D.
Larsell, O., XVII (2) D.
Laufer, B., 10.
Lawrence, A. W., 4.
Leclerc, H., 28.
Le Gendre, P., XIX (1) D.
Lenghel, A., 50.
Lenoir, R., XVIII (1) E.
Lentz, W., III (2).
Leroux, D., XVIII (2) B.
Leroux, L., XVIII (2) B.
Levi, A., 4.
Levinson, A., XIX (2) D.
Lévy, I., 4.
Liebig, J. von, XIX (1) B.
Lindley Library, 28.
Lint, J. de, XVII (2) D.
Lippmann, E. O. von, XVIII (2) B.
Lloyd, J. H., XVII (1) E.
Lobachevsky, N. I., XIX (1) A.
Lodge, Sir O., 49.
Löffler, E., 20.
Long, E. R., 50.
Loomis, E. S., 20.
Lorenz, H., XIX (2) B.
Lotz, H., XIX (1) B.
Lundsgaard, K. K. K., XIX (2) D.
Luria, S., V B. C.

M

Mackenzie, A., XVIII (2) C.

Mackmull, G., XIX (1) D.
Macler, F., 8.
MacMillan, D. B., XX C.
Malinowski, B., 40.
Marchal, G., 25.
Marsiglio of Padua, XIV (1).
Maslama ibn Ahmad, X (2).
Maspero, H., 10.
Mathiez, A., XVIII (2) E.
Matschoss, C., XIX (1) B, XIX (2) B, 26.
Mattirolo, O., 2.
Maxwell, J., 41.
Mayer, M., XIX (1) B.
McLean, R. C., I (1) B. C.
Meek, W. J., XIX (1) D.
Mehmke, R. L., 2.
Meige, H., 50.
Meissner, B., 3.
Meldrum, A. N., XVII (2) B, XVIII (2) B, XIX (1) B.
Menascha, I., 2.
Menzel, T., 14.
Mercier, L., 14.
Merck, E., 53.
Meritt, B. D., V B. C.
Merz, L., 26.
Mesnard, P., XVI (2) E.
Metz, A., 22.
Meyer, A., 16.
Meyer, E., 2.
Meyerhof, M., XI (1), 51.
Michel, J., 22.
Mieli, A., XVIII (2) B
Migeon, G., 14.
Mikami, Y., 10.
Miller, G. A., III (2) B. C., 20.
Millikan, R. A., 24.
Möller, G., 2.
Moinet, P., 5.
Moll, F., 26.
Moll, O. E. E., 26.
Monks, G. H., XIX (2) D.
Montandon, G., 11.
Moodie, R. L., 29.
Mookerji, R., III (2) B. C., 9.
Mourgue, R., XVIII (2) D.
Müller, F., IV (1) B. C.
Muraski, Lady, X (2).
al-Mu tazilî, Abû 'l-Husain 'Abdarraḥîm ibn Muḥammed ibn 'Othmân al-Khaijat, X (1).

N

Nachtweh, A., XIX (1) B.
Näsström, G., 50.
Nakaseko, R., 25.
Nasmith, F., 26.
Naumburg, R. E., XIX (1) B.
Needham, J., 27.
Negker, J. de, XVI (1) D.
Nell, A., 9.
Neugebauer, O., 3.
Nevins, A. F., XIX (1) C.
Newberry, P. E., 2.
Newell, L. C., XVIII (2) B, 25.
Nilsson, M. P., 1.
Nitobé, I., 11.
Nöldeke, T., VII (1).
Nonnenmacher, G., XIX (2) B.
Nuyens, B. W. T., XVI (2) D.

O

Obermeier, O., XIX (2) D.
Oersted, H. C., XIX (1) B.
Ogata, K., XIX (2) D.
Olschki, L., XVII (1) B.
Oribasios, IV (2).
Orth, F., 26, 32.
Osborn, H. F., 35.
Ostwald, W., XIX (2) B.
Otsuki, N., 11.

Ovington, J., XVII (2) C.

P

Packard, F. R., XVII (2) C.
Paracelsus, XVI (1) D.
Partington, J. R., XVIII (2) B, 25.
Pas, J. de, XVI (2) D.
Pascal, B., XVII (1) A.
Pastori, M., 20.
Peeters, P., XX A.
Pelagius, V (1).
Peltzer, R. A., 26.
Pestalozzi, XVIII (2) E.
Peters, H., 28.
Petty, Sir W., XVII (2) E.
Pfeiffer, D., 26.
Pfister, C., XVIII (2) E.
Pharmacopoeia Augustana, XVI (1) D.
Pieper, W., 32.
Pipkin, C. W., 43.
Pitfield, R. L., XVII (2) D.
Plato, IV (1) B. C.
Plessner, M., X (1), 25.
Plotin, III (2).
Porteous, A., 28.
Powicke, F. M., XIII (1).
Price, G. E., XVI (2) D.

R

Ramón y Cajal, S., 34.
Raispail, Mme X., XIX (1) C.
Rassow, B., XIX (1) B.
Regnier, R., 29, 57.
Reichborn-Kjennerud, J., 40.
Reitböck, G., XIX (2) B.
Reitzenstein, R., 4.
Revue Historique, 44.
Rey, A., 2.
Ritter, W. E., 18.
Rivier, G., XVIII (2) D.
Robinson, H. P., II (2).
Robinson, V., XIX (2) D.
Roe, J. W., XVIII (2) B, 26.
Rohr, M. von, 24.
Rosenfeld, L., XVII (2) A.
Rostafinski, J., XVII (2) C.
Rostovtzeff, M. I., 1, 5.
Rotth, A., XIX (2) B.
Rudd, W. R., 26.
Rübel, E., 28.
Rugani, L., XVII (2) B.
Ruska, J., VIII (2), 14, 16.
Russell, B., 19.

S

Sabbatani, L., XVI (2) D.
Salet, P., XI (2).
Sanzin, R., XIX (1) B.
Sarton, G., XVII (2) E, 6, 16.
Sassoon, D. S., 12.
Schetelig, H., IX (1).
Schevensteen, A. van, 52.
Schiffner, C., XVIII (2) B.
Schilfgaarde, A. P. van, XVII (2) D.
Schmidt, R., 9.
Schmidt, W., XIX (2) B.
Schmieder, K. C., 25.
Scholz, H., 4.
Schoy, C., XI (1).
Schubert, P., I (1) B. C.
Schulz, B., XIX (2) B.
Schweinfurth, G., 2.
Schwemann, A., XVIII (2) B, XVIII (2) C.
Scolten, A., XVII (1) D.
Scoon, R., 4.
Seidell, A., XIX (2) B.
Semenza, G., XV (2) L.
Seyfert, W., 6.
Shand, S. J., 31.

Sharpless, W. T. S., XVIII (2) D.
Shaw, Sir N., 33.
Sieur, 52.
Simpson, D. C., 2.
Singer, C., 16, 28, 34, 49, 50.
Singer, D. W., XII (1).
Singh, A. N., 9.
Smirnov, V. D., 14.
Smith, D. E., 20.
Smith, E. C., XIX (1) B.
Smith, G. E., 16, 40.
Smith, R. P., 8.
Smith, S., 3.
Söderbaum, H. G., XIX (1) B.
Söderblom, N., 49.
Somadeva, XI (2).
Sommer, F., 26.
Sparn, E., 32.
Spinden, H. J., 40.
Spinoza, XVII (2) E.
Spokes, S. XIX (1) C.
Srikantia, B. M., XX A.
Staby, D., XIX (1) B.
Stammler, G., 20.
Stapleton, T., XVI (1) E.
Steele, R., XII (1).
Sterner-Rainer, R., XIX (1) B.
Stevens, H. N., XVI (1) C.
Stones, G. B., 25.
Strauss, H. R., XVII (1) B.
Strauss-Klöbe, S., XVII (1) B.
Strecker, K., 6.
Sudbury, L., 32.
Suys, E., IV (2) B. C.
Suzuki, D. T., 10.
Swoboda, H., 4.
Szumowski, W., XVI (1) D, XVIII (2) D, 50.

T

Taggart, W. T., XIX (2) B.
al-Tahâwî, IX (2).
Tallgren, O. J., II (1).
Tallqvist, K., 33.
Tanakadate, A., 11.
Tannery, P., 18.
Tarn, W. W., 4.
Tassmann, G., 40.
Taylor, F. L., XIX (1) D.
Temkin, O., 50.
Theobald, (Dr)., XI (2), XVII (1) B.
Thomälen, A., XIX (2) B.
Thomas-Stanford, C., III (1) B. C.
Thompson, J. W., 6.
Thomsen, O., XIX (2) D.
Thomsen, V. L. P., XIX (2) E.
Thomson, E., XIX (2) B.
Thomson, S. H., XIV (1).
Thordemann, B., 35.
Thorndike, L., XIII (2), XIV (1), XV (2), 6.
Tiberghien, G., XIX (2) E.
Treptow, E., 32.
Trew, A., XVII (2) E.
Triewald, M., XVIII (1) B.
Tucci, G., IV (2).
Turnbull, A. D., 26.
Tyas, G. F., XIX (1) B.

V

Varthema, L. di, XVI (1) C.
Vetter, Q., XVI (2) A.
Vogel, J. P., 9.
Vogliano, A., IV (2) B. C.
Vogts, H., XV (1).
Voigt, H., XIX (2) B.
Vosmaer, G. C., 29.
Vries, H. de, 20.

W

Wagner, H. R., XVI (2) C, XIX (1) C.
Waldschmidt, E., III (2).
Walker, H. M., XIX (1) A.
Wallach, E., XVII (1) D.
Walsh, J., II (2).
Walther, J., XIX (1) E.
Wegener, A., 32.
Weicker, W., XIX (2) B.
Weill, R., 2.
Wenger, L., 5.
Weynants-Ronday, M., 2.
Whitehead, A. N., 19.
Wiberg, J., XVII (1) D.
Wickersheimer, E., 6.
Wieleitner, H., XVII (1) A, 20.
Wiese, E. R., XIX (2) D.
Wiley, H. W., XIX (2) B.
Willard, J. F., 6.
Williams, G. A., XVI (1) D.
Wilson, Lieut.-Col. Sir A. T., 8.
Wilson, Thomas of Stow, I (2).
Witte, J., 11.
Wolf, A., 18.
Wolfson, H. A., XVIII (2) E.
Wreszinski. W., 2.
Wright, J., 40, 50.

Y

Yarrow, Lady, XIX (2) B.

Z

Zambonini, F., XIX (2) B.
Zimmer, J. T., 29.
Zimmern, A., 17.
Zulueta, F. de, XIX (2) E.